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# FLORA

OF

THE UPPER GANGETIC PLAIN,

AND OF THE

ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

BY

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PLUMBAGINACEÆ TO PLANTAGINACEÆ.

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An erect glaucous shrub, 6-10 ft. high. *Stem* terete, striate, somewhat scurfy. *Leaves* perfoliate, up to 5 in. long, thick, coriaceous, more or less covered with scurfy scales; the lower ovate, obtuse; upper orbicular and often apiculate, margins undulate. *Flowers* crowded in panicle spikes, shortly pedicelled; *bracts* small, lanceolate. *Calyx* tubular, about  $\frac{1}{2}$  in. long, winged between the 5 strong ribs, the wings membranous and transversely wrinkled; teeth acute, equalling about  $\frac{1}{2}$  the length of the tube. *Corolla-tube* nearly 1 in. long; lobes  $\frac{1}{2}$ - $\frac{1}{4}$  in., obovate-oblong, emarginate, apiculate. *Stamens* slightly protruding from the throat of corolla. *Style* hairy at the base. *Capsule*  $\frac{1}{4}$  in. long or more. *Seed* pyriform, smooth,  $\frac{1}{8}$  in. long.

Confined to the dry western border of the area within the districts of Ajmer and Merwára. Flowers during the cold season. **DISTRIB.:** Mt. Abu in Rajputana, Sind and in the drier portions of the Bombay Presidency. Found also in Arabia.

#### LXIV.—PRIMULACEÆ.

Perennial, rarely annual, herbs. *Leaves* all radical, or radical and cauline, exstipulate. *Flowers* 2-sexual, regular. *Calyx* inferior (except *Samolus*), 5- (rarely 4-9) cleft. *Corolla* hypogynous (except *Samolus* and none in *Glaux*), rotate, bell- or funnel-shaped, usually 5-cleft. *Stamens* on the corolla-tube and opposite the lobes (hypogynous and with alternating staminodes in *Glaux*), filaments usually short, *anthers* 2-celled and dehiscing usually by slits. *Ovary* 1-celled, usually free, sub-globose or ovoid, *style* short or long, *stigma* undivided; ovules many, on a free central placenta. *Capsules* dehiscing transversely or by valves, few- or many-seeded. *Seeds* minute, usually angular, often sunk in the placenta.—Species about 250, chiefly in N. temperate and alpine regions.

##### Ovary superior:—

Corolla with a distinct tube, lobes imbricate:—

- |                              |               |
|------------------------------|---------------|
| Corolla-tube long . . . . .  | 1. PRIMULA.   |
| Corolla-tube short . . . . . | 2. ANDROSACE. |

Corolla divided nearly to the base, lobes contorted:—

- |  |                 |
|--|-----------------|
| Capsule opening by valves . . . . .      | 3. LYSIMACHIA.  |
| Capsule splitting transversely.          |                 |
| Corolla exceeding the calyx . . . . .    | 4. ANAGALLIS.   |
| Corolla shorter than the calyx . . . . . | 5. CENTUNCULUS. |

- |  |             |
|--|-------------|
| Ovary $\frac{1}{2}$ -inferior, corolla-lobes imbricate . . . . . | 6. SAMOLUS. |
|--|-------------|



## 1. PRIMULA, Linn.; Fl. Brit. Ind. iii, 482.

Perennial scapigerous herbs. *Flowers* umbelled or whorled, rarely solitary, dimorphic in regard to length of style and position of stamens. *Calyx* 5-cleft. *Corolla* funnel- or salver-shaped; throat naked, or with folds opposite the lobes; lobes 5, spreading or incurved. *Stamens* 5, included. *Ovary* ovoid, obovoid or globose. *Capsule* globose oblong or cylindrical, 5-valved; valves simple or 2-fid. *Seeds* angular or subglobose, peltately attached.—Species about 150, mostly in northern and temperate regions.

*P. floribunda*, Wall. Tent. Fl. Nep. 43, t. 33; F. B. I. iii, 495; Collett Fl. Siml. 299.

Glandular-pubescent. *Leaves* 2-4 in., elliptic, acute or obtuse, narrowed into a broadly-winged petiole, coarsely and irregularly toothed. *Scapes* numerous, stout, 4-8 in. long. *Flowers* in whorls of 2-8; bracts shorter than the very unequal pedicels, ovate or elliptic, acuminate, toothed. *Calyx* campanulate, hemispheric in fruit, cleft to the middle; lobes ovate, acute, glandular. *Corolla* salver-shaped, yellow; tube  $\frac{1}{2}$ - $\frac{1}{3}$  in., pubescent, throat dilated, mouth annulate; limb  $\frac{1}{2}$ - $\frac{1}{3}$  in. in diam., lobes obcordate. *Ovary* rounded at the apex, stigma globose. *Capsule* globose. *Seeds* very small, black, angled, minutely papillose.

Dehra Dun, in damp shady ravines (Wallich, T. Thomson, etc.) *Flowers* during the cold season. *DISTRIB.*: W. Himalaya up to 8,000 feet, extending to Afghanistan.

## 2. ANDROSACE, Linn.; Fl. Brit. Ind. iii, 495.

Perennial, rarely annual, low herbs. *Leaves* various, rosulate, or imbricate on the branches. *Flowers* small, white, lilac or red. *Calyx* 5-lobed or-partite. *Corolla* salver-shaped with a very short tube, or funnel-shaped; limb 5-lobed; mouth annulate, or with folds opposite the lobes. *Stamens* 5, anthers subsessile, included, obtuse. *Ovary* globose, style short. *Capsule* ovoid or globose, 5-valved. *Seeds* 2, rarely more angular or subglobose; embryo transverse.—Species about 50, chiefly in N. temp. and Arctic regions, or on lofty mountain ranges.

*A. saxifragæfolia*, Bunge Enum. Pl. Chin. Bor. 53; Prain Beng. Pl. 640.

A glandular-pubescent annual. *Leaves*  $\frac{1}{2}$ - $\frac{2}{3}$  in. in diam., ovate or suborbicular, cordate, crenate; petiole equalling or longer than the blade. *Scapes* many, twice or three times longer than the leaves; involucres  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, pedicels very unequal. *Calyx* deeply 5 cleft; lobes elliptic, acuminate, enlarging and spreading in fruit, prominently

veined. *Corolla* scarcely extending beyond the calyx, white or pink; tube globose, much contracted at the mouth. *Capsule* globose, whitish. *Seeds* minute, angular, pitted.

Dehra Dun and Siwalik range, and in the submontane tracts from Rohilkhand to Gorakhpur. Flowers during the cold season. **DISTRIB.**: Panjab Plain, and eastwards to N. Bengal and Calcutta; Betul Dist. of the C. Prov.; Outer Himalaya from Kumaon to Sikkim up to 5,000 feet. Found also in China, Japan and in the Loochoo Island.

### 3. *LYSIMACHIA*, Linn.; Fl. Brit. Ind. iii, 501.

Erect procumbent or creeping herbs. *Leaves* quite entire, opposite alternate or whorled. *Flowers* solitary racemed or in spikes. *Calyx* 5-6-partite. *Corolla* rotate or funnel-shaped, 5-6-partite. *Stamens* inserted on the base of the corolla-lobes. *Ovary* subglobose; *style* filiform, persistent; *ovules* many. *Capsule* globose or subglobose, 5-valved or bursting irregularly, many-seeded. *Seeds* trigonous or plano-convex.—Species about 60, chiefly in N. temp. regions.

*L. obovata*, Buch.-Ham. ex Wall. Cat. 1488; Royle Ill. 310; F. B. I. iii, 502. *L. candida*, Lindl. in Journ. Hort. Soc. i, 301.

An erect somewhat glaucous herb. *Stem* 6-18 in. high, simple or branching from the base. *Leaves*  $\frac{1}{2}$ -3 in. long, obovate-spathulate or oblanceolate, acute or obtuse, minutely gland-dotted, the lower ones long petioled. *Racemes* 2-8 n. long, laxly flowered; *pedicels*  $\frac{1}{2}$  in., bracts equalling or shorter than the pedicels, subulate. *Calyx-segments* lanceolate, acuminate. *Corolla* twice as long as the calyx, lobes obovate. *Filaments* short, anthers apiculate. *Capsule*  $\frac{1}{2}$  in. in diam., bursting irregularly.

Dehra Dun (Duthie); and in the Sub-Himalayan tracts from Rohilkhand to Gorakhpur (Duthie's collectors). Flowers during March and April. **DISTRIB.** Manipur and Upper Burma, extending to China, Japan and Java.

### 4. *ANAGALLIS*, Tournef.; Fl. Brit. Ind. iii, 505.

Slender annual or perennial herbs. *Leaves* opposite, quite entire. *Flowers* axillary, solitary, peduncled, ebracteate, red or blue, rarely white. *Calyx* 5-partite. *Corolla* rotate, 5-partite. *Stamens* 5, attached to the base of the corolla, villous. *Ovary* globose, style filiform, stigma globose; *ovules* many, amphitropous. *Capsule* globose, circumsciss. *Seeds* many, peltate, plano-convex.—Species 12, in Temp. Asia, Europe, N. Africa and in Temp. S. America.

*A. arvensis*, Linn. *Sp. Pl.* 148; *Royle Ill.* 309; *F. B. I.* iii, 506; *Watt E. D.*; *Collett Fl. Siml.* 302; *Cooke Fl. Bomb.* ii, 80; *Prain Beng. Pl.* 649.  
—Poor Man's Weather-glass.

An erect or procumbent glabrous annual, branching from the base. *Branches* ascending, 5-15 in. long, quadrangular, glabrous. *Leaves* sessile, up to one inch long, ovate or lanceolate, cordate, acute, gland-dotted. *Peduncles* 1-2 in., erect in flower, decurved in fruit. *Calyx*-lobes narrowly lanceolate, acuminate. *Corolla*  $\frac{1}{2}$ - $\frac{1}{2}$  in. in diam., a little shorter than the calyx, margins of lobes usually ciliate. *Capsule* about  $\frac{1}{2}$  in. in diam., dehiscing transversely at the middle, *style* persistent. *Seeds* trigonous.

Abundant throughout the area especially as a weed of cultivation, flowering during the latter part of the cold season. Flowers always blue within this area. **DISTRIB.** Over the greater part of India ascending to 7,000 feet on the Himalaya. The red-flowered variety is frequently found in Kashmir, and both kinds extend to Europe and W. Asia. The flowers always close up in cloudy weather.

### 5. CENTUNCULUS. Linn.; Fl. Brit. Ind. iii, 506.

Small annual herbs. *Leaves* alternate or the lower subopposite, sessile or nearly so, entire. *Flowers* minute, solitary, axillary, ebracteate, white or pink. *Calyx* 4-5-partite. *Corolla* urceolate, 4-5-fid. *Stamens* 4-5, on the corolla throat; *filaments* flattened glabrous. *Ovary* subglobose; *style* filiform, *ovules* many. *Capsule* globose, circumsciss. *Seeds* many, peltate. Species 3 or 4, in Europe, Asia and America.

*C. pentandrus*, R. Br. *Prod.* 427. *C. tenellus*, Duby; *F. B. I.* iii; 506; *Cooke Fl. Bomb.* ii, 80; *Prain Beng. Pl.* 641; *Collett Fl. Siml.* 303.

A slender erect branching glabrous annual, up to 8 in. high. *Stem* with the angles more or less winged. *Leaves* alternate, subsessile,  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, ovate orbicular or obovate, obtuse or subacute, apiculate. *Flowers* 1-5-merous; *peduncles* filiform,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, erect in flower, spreading in fruit. *Calyx*-segments narrowly lanceolate, acuminate. *Corolla* shorter than the calyx, white; tube subglobose, lobes ovate-lanceolate. *Capsule* membranous, dehiscing transversely about the middle. *Seeds* minute, trigonous.

Dohra Dun (Gamble). **DISTRIB.:** Chota Nagpur, extending to C. and S. India. It is found also on the Central and W. Himalaya up to 4,000 feet, and beyond India it extends to Trop. America and Australia.

### 6. SAMOLUS. Tournef.; Fl. Brit. Ind. iii, 506.

Annual or perennial herbs. *Leaves* radical and alternate. *Flowers* in terminal racemes or corymbs, white; pedicels bracteate. *Calyx*

$\frac{1}{2}$ -superior, 5-fid. *Corolla* perigynous, subcampanulate, 5-partite. *Stamens* 5, alternating with staminodes, *filaments* very short. *Ovary* subglobose, *style* short; *ovules* many, anatropous. *Capsule*  $\frac{1}{2}$ -infer., ovoid, crown 5-valved. *Seeds* many, angular; hilum basilar.—Species 8, in temperate regions of both hemispheres.

**S. Valerandi**, *Linn. Sp. Pl.* 443; *Royle Ill.* 310; *F. B. I.* iii, 506; *Collett Fl. Siml.* 303.—(Brook-weed.)

A glabrous perennial herb; root-stock short. *Stem*  $\frac{1}{2}$ -2 feet, erect decumbent or ascending, often rooting at the base. *Leaves* 1-4 in. long, entire, radical rosulate. *Racemes*  $\frac{1}{2}$ -6 in. long; *pedicels* filiform, spreading in fruit, bracteate above the middle. *Calyx* hemispheric, lobes triangular. *Corolla*  $\frac{1}{2}$  in. in diam.; lobes short, obtuse. *Capsule* shorter than the calyx. *Seeds* rugose.

Bundelkhand (Edgeworth), rare. **DISTRIB.:** Punjab Plain and W. Him. up to 4,000 feet, extending westward to Europe and found in most temperate regions.

## LXV.—MYRSINACEÆ.

Shrubs or small trees. *Leaves* alternate, undivided, usually gland-dotted, exstipulate. *Flowers* 2-sexual or polygamo-dioecious, regular. *Calyx* inferior (in *Mæsa* more or less adnate to the ovary); limb 4-6- (usually 5-) lobed, persistent and somewhat enlarged in fruit. *Corolla-tube* short or none; segments usually 5, rarely 3 or 7, contorted or imbricate, rarely valvate. *Stamens* as many as the corolla-lobes and opposite to them, free or adnate to the tube; *filaments* usually short, free or more or less connate (in *Reptonia* alternating with staminodes). *Anthers* dehiscing longitudinally, rarely by terminal pores. *Ovary* 1-celled, globose or ovoid, usually free ( $\frac{1}{2}$ -infer. in *Mæsa*), usually narrowed into a simple style; *stigma* capitate, rarely shortly lobed; *ovules* few or many, inserted on a free central placenta. *Fruit* usually small and globose.

Cor.-lobes imbricate in bud, anthers not longer than the filaments, ovules few . . . .	1 EMBELIA.
Cor.-lobes contorted in bud, anthers much longer than the filaments, ovules many . . . .	2 ARDISIA.

### 1. EMBELIA, Burm.; Fl. Brit. Ind. iii, 512.

Shrubs mostly climbing, or small trees. *Leaves* entire or toothed; *petiole* often margined or glandular. *Racemes* axillary or terminal,

simple or compound, or flowers subsessile; bracts usually small, bracteoles 0. Flowers small, polygamous, mostly dioecious, white or greenish-yellow. Calyx free, 5-fid. or-partite, persistent. Petals 4-5, free or slightly cohering at the base, elliptic, spreading or reflexed, usually imbricate in bud. Stamens 4-5; filaments more or less adnate to the petals, anthers ovate-oblong. Ovary ovoid or globose, rarely with a conical beak, ovules few. Fruit small, globose, usually 1-seeded. Seeds globose, hollowed at the base; endosperm pitted or subruminate.—Species 92 (fide Mez), in the tropics of the Old World.

Flowers 5-merous, leaves glabrous except on the nerves beneath . . . . . 1. *E. robusta*.

Flowers 4-merous, leaves tomentose or puberulous beneath . . . . . 2. *E. villosa*.

1. *E. robusta*, Roxb. Hort. Beng. 16; Fl. Ind. i, 537; F. B. I. iii, 515 (in part); Brandis For. Fl. 284; Ind. Trees 416; Watt, E. D.; Kanjilal For. Fl. Sch. Circ. 216; Gamble Man. Ind. Timb. 440; Mez in Engl. Pflanzenreich iv, 319; Cooke Fl. Bomb. ii, 85; Prain Beng. Pl. 643. *E. picta* A. DC.; Royle Ill. 265.—Vern. Bayabirang, gaia (Dehra Dun).

A large rambling shrub or small tree. Branches stout, the younger ones densely rusty-tomentose. Bark brown, with horizontal cracks and numerous lenticels. Leaves membranous and gland-dotted, 2½-5 in. long, obovate or broadly elliptic, obtuse or subacute or abruptly acuminate, rounded or subacute at the base, entire or irregularly toothed, glabrous on the upper surface, usually rusty-pubescent beneath; main nerves 6-12 pairs, slender, conspicuous and with reticulate veins beneath; petioles about ¾ in. long, channelled above, papillose. Racemes axillary, shorter than the leaves, rusty-puberulous. Flowers 5-merous, greenish-yellow; pedicels longer than the calyx. Sepals slightly connate at the base, ovate, subacute, margins glandular. Petals nearly free, twice as long as the sepals, elliptic-oblong, gland-puberulous, papillose inside. Ovules few, embedded in pulp. Capsule subglobose, red when ripe.

Dehra Dun and Siwalik range, sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand. Flowers July-Sep. DISTRIB.: Throughout the greater part of India, also in Ceylon and Burma. The berries are used medicinally. From the young leaves a gargle is prepared, and the dried root-bark is considered to be a remedy for toothache. In Chota Nagpur the berries are much used for the adulteration of black pepper.

2. *E. villosa*, Wall. in Roxb. *Fl. Ind.* (ed. Carey & Wall.) ii, 289 ; Wall. *Cat.* 2313; Mez in *Engl. Pflanzenreich* iv, 320. *E. robusta*, C. B. Clarke in *F. B. I.* iii, 515 (not of Roxb.).

*Branches* rather thick, densely rusty-villous, the younger ones spotted with minute pale lenticels. *Leaves* 4-5 in. long, obovate or obovate-elliptic, obtuse or shortly acuminate, acute at the base, entire, cartilaginous, upper surface glabrescent, canescent-tomentose and minutely punctate beneath, margins ciliate; petiole about  $\frac{1}{2}$  in. long, round, villous. *Racemes* shortly peduncled, longer than the leaves, usually in fascicles of 2-3, cylindric, many-flowered, rusty-villous *pedicels* about as long as the caducous filiform bracts. *Flowers* 4-merous, small, whitish, shortly pedicelled. *Sepals* lanceolate, acute, villous on the back and margins, punctate. *Petals* narrowly lanceolate, acute, punctate, glabrous outside, distinctly papillose inside.

Dohra Dun (Gamble); Kheri district in N. Oudh (Duthie's collectors). **DISTRIB.**: Bengal, on the Rajmahal Hills. This species differs from *E. robusta* chiefly by the long fascicled racemes. It is also much more hairy.

## 2. *ÆDISIA*, Swartz; *Fl. Brit. Ind.* iii, 518.

Shrubs or small trees. *Leaves* sessile or petioled. *Flowers* usually 2-sexual, white or rose-coloured, in axillary or terminal simple or compound umbels or corymbs; *bracts* small, usually deciduous or 0. *Calyx* 5- (rarely 3- or 4-) lobed, persistent and often somewhat enlarged in fruit; lobes contorted or imbricate. *Corolla* usually 5-partite, segments twisted to the right in bud. *Stamens* 5, attached to base of corolla; filaments free, usually very short; anthers sagittate, ovate-lanceolate, acuminate or apiculate, rarely obtuse, dehiscing inwards longitudinally. *Ovary* ovoid globose or pyramidal; style cylindric, often much longer than the corolla-lobes, stigma punctiform; ovules few or many, immersed in a globose placenta. *Fruit* globose or subglobose, usually apiculate with the persistent style. *Seed* solitary, globose.—Species upwards of 235, chiefly in Trop. Asia.

*A. solanacea*, Roxb. *Cor. Pl.* i, 27, t. 27; *Fl. Ind.* i, 530; Mez. in *Engl. Pflanzenreich* iv, 132; Cooke *Fl. Bomb.* ii, 86. *A. humilis*, A.D.O. (not of Vahl); Royle *Ill.* 265; Brandis *For. Fl.* 287; *Ind. Trees* 418 (in part); *F.B.I.* iii, 529 (in part); Watt *E.D.*; Kanjilál *For. Fl. Sch. Circ.* 217; Gamble *Man. Ind. Timb.* 441; Prain *Beng. Pl.* 645.

A large much-branched shrub or small tree. *Branches* thick, glabrous showing the scars of fallen leaves. *Leaves* scattered, obovate oblanceolate or oblong-elliptic, tapering to an acute base, shortly and

broadly acuminate or subobtusate at the apex, cuneate at the base, entire, subcoriaceous, fleshy, glabrous, minutely punctate; lateral nerves many, slender, reticulate between them; petioles about  $\frac{1}{2}$  in. long, winged. *Corymbs* axillary, often from the axils of fallen or reduced leaves, few-flowered, shorter than the leaves, glabrous; pedicels  $\frac{1}{2}$ -1 in. or more in length, stout and thickening upwards; bracts narrowly oblong, acute, about  $\frac{1}{10}$  in. long, deciduous. *Flowers* in axillary corymbose racemes, rose-coloured, or pinkish, about  $\frac{1}{2}$  in. across. *Calyx-lobes* 5, free,  $\frac{1}{4}$  in. long, ovate orbicular, gland-dotted. *Petals* slightly connate at the base, broadly elliptic, acute, marked with dark lines, punctate. *Stamens* 5, shorter than the petals, *filaments* very short; *anthers* large, lanceolate, acute. *Ovary* free, ovoid, glabrous. *Fruit*  $\frac{1}{4}$  in. in diam., subglobose, with a depressed apex, purplish-black when ripe and filled with a pinkish-coloured pulp.

Dehra Dun, Siwalik range, sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur, usually in damp shady spots. *Flowers* in March and April, the fruit ripening during the cold season. *DISTRIB.*: Himalaya up to 5,000 ft. and throughout India (except in the drier western portion), extending to Malaya and China. The juice of the berries is said to yield a good yellow dye. *A. humilis* cf Vahl is a small sea-coast shrub found in S. India and Ceylon and on the shores of Malacca and Siam. It differs by having the flowers in terminal compound racemes, and in its corolla-tube which is much longer than that of *A. solanacea*.

## LXVI.—SAPOTACEÆ.

Trees or shrubs; young parts often rusty-tomentose. *Leaves* alternate, rarely sub-opposite, coriaceous, entire, petioled; stipules 0 or very caducous. *Flowers* 2-sexual, small or medium-sized, axillary; pedicels clustered, rarely solitary or panicled; bracts and bracteoles 0 or minute. *Calyx-lobes* 4-8, much imbricated, or 2-seriate with the outer series valvate, persistent. *Corolla-tube* shorter than the calyx, lobes as many or 2-4 times as many as those of the calyx. *Stamens* on the corolla-tube, as many as the corolla-lobes and opposite to them, or 2-3 times as many, 1-3-seriate; filaments usually short; anthers oblong-lanceolate, connective often produced; staminodes (when present) alternate to stamens. *Ovary* superior, sessile, 2-8-celled; style linear; ovules solitary in each cell, usually attached to the inner angle. *Berry* indehiscent, 1-8-seeded. *Seeds* ellipsoid or compressed, exalbuminous, with large fleshy cotyledons, or albuminous with flat cotyledons, testa usually crustaceous.—Species about 320, in the tropics of both hemispheres.

Calyx-segments 4-5, staminodes none	:	:	1. BASSIA.
Calyx-segments and staminodes 6-8	:	:	2. MIMUSOPS.

## 1. BASSIA, Kœn. ex Linn.; Fl. Brit. Ind. iii, 543.

Trees, usually with milky juice. *Leaves* coriaceous, crowded towards the ends of the branchlets. *Stipules* caducous. *Flowers* axillary, fasciated among the subterminal tufts of leaves, or in the axils of fallen leaves. *Calyx* segments 4, in two series, the 2 outer lobes valvate and enclosing the inner (except in *B. butyracea*), *Corolla* campanulate; lobes usually 8-10, contorted in bud. *Stamens* at least twice as many as the corolla-lobes, usually 16-20; anthers lanceolate, acute, connective often produced. *Staminodes* 0. *Ovary* usually 6-8-celled, villous; style subulate, often elongate. *Berry* globose or ovoid, fleshy. *Seeds* few or solitary, albumen 0.—Species about 30, inhabiting India and the Malay Archipelago.

Corolla-tube fleshy, lobes erect, anthers sessile 1. *B. latifolia*.

Corolla-tube not fleshy, lobes spreading, filaments nearly as long as the anthers . . . 2. *B. butyracea*.

1. *B. latifolia*, Roxb. Cor. Pl. 1, 20, t. 19; Fl. Ind. ii, 526; Royle Ill. 263; Brandis For. Fl. 299; Ind. Trees 426; F. B. I. iii, 544; Watt E. D.; Gamble Man. Ind. Timb. 447; Kanjilal For. Fl. Sch. Circ. 218; Cooke Fl. Bomb. ii, 92; Prain Beng. Pl. 640.—Vern. Mahua, mohwa. (The Mahua tree.)

A large deciduous tree. *Bark* grey or blackish with shallow transverse wrinkles and vertical cracks, the inner portions reddish and milky. *Branches* many, spreading, forming a close symmetrical head. *Leaves* clustered at the ends of the branches, 5-9 in. long, elliptic obovate or broadly lanceolate, rounded or acute at the base, obtuse or shortly acuminate at the apex, coriaceous, firm, densely woolly beneath when young, at length glabrous; main lateral nerves 10-14 pairs; petioles 1-1½ in. long; stipules subulate, pubescent, soon falling. *Flowers* in clusters at the ends of the branches; pedicels 1-1½ in. long, drooping, rusty-tomentose. *Calyx* ½ in., divided nearly to the base, densely tomentose; segments usually 4, subacute, the two outer valvate and enclosing the others. *Corolla* about ½ in. long, cream-coloured; tube ovoid, fleshy, ½ in. long; lobes usually 8-9, ovate-lanceolate, acute, erect. *Stamens* usually 24-26; anthers in 3 series, sessile, acuminate, hairy on the back. *Ovary* hirsute; style 1 in. or more in length, hairy at the base. *Berry* 1-2 in. long, fleshy, ovoid, greenish, 1-4-seeded.

Dehra Dun and on the Saharanpur Siwaliks, but more abundant eastwards in the submontane forest tract of Rohilkhand and N. Oudh; also in Bundelkhand. The tree blossoms during March and April before the new leaves appear, and the fruit ripens in June and July. **DISTRIB.:** From W. Beng., C. India and the C. Prov. to N. Kanara; also in Upper Burma. The tree is extensively cultivated within the area of this flora, especially in the eastern and southern divisions. It is



greatly valued for its sweet succulent corollas, which are eaten either raw or cooked, or made into sweetmeats. A coarse kind of spirit is also distilled from the flowers. The fruit is eaten, and from it is extracted an oil, which is used for soap-making as well as for burning and cooking. The oil-cake is used for poisoning fish. The heartwood is of very good quality, but owing to the value of the flowers and fruit the tree is very seldom felled.

**2. B. butyracea**, Roxb. in *As. Res.* viii, 477; *Fl. Ind.* ii, 527; *Don. Prod.* 146; *Royle Ill.* 263; *Brand. For. Fl.* 290, t. 35; *Ind. Trees* 427; *F. B. I.* iii, 546; *Watt E. D.*; *Kanjilal For. Fl.* 219; *Gamble Man. Ind-Timb.* 448.—*Vern. Cheuli* (Oudh), *chiura* (Kumaon).

A large tree, with dark grey or brownish bark. *Leaves* coriaceous, crowded near the ends of the branches, 6-12 in. long, obovate or obovate-oblong, sub-obtuse, rhomboid at the base, tomentose when young, glabrous or floccose-tomentose beneath when mature; primary nerves 15-20 pairs; petiole 1-1½ in.; stipules ½ in., ovate-lanceolate, caducous. *Flowers* crowded below the sub-terminal leaves, drooping, tomentose. *Calyx* coriaceous, rusty-villous; lobes 5, imbricate, not 2-seriate. *Corolla* ¾ in. long, tube pale-yellow, cylindrical, not fleshy; lobes 8-10, spreading. *Stamens* 30-40, inserted at the mouth of the corolla tube; filaments glabrous, nearly as long as the anthers; anthers exserted, linear-lanceolate, not hairy. *Ovary* 7-9-celled. *Berry* ovoid, smooth, 1-3-seeded.

Dehra Dun at Tapoban, and occasionally as a small tree in the forests of the Gonda district in N. Oudh. Flowers Nov. to Jan. *DISTRIB.*: Sub-tropical Himalaya up to 5,000 ft. from Kumaon to Sikkim and Bhutan. The seeds yield a white substance resembling lard, which remains solid and does not deteriorate in the plains during the hot weather. It is used in the manufacture of soap and candles, and in the preparation of an ointment for relieving rheumatic pains. The pulp of the fruit and the oil-cake are eaten.

## 2. MIMUSOPS, Linn.; *Fl. Brit. Ind.* iii, 548.

Trees with milky juice. *Leaves* coriaceous, with many slender spreading primary nerves. *Flowers* axillary, solitary or in fascicles. *Calyx-segments* 6-8, in 2 series; outer series valvate in bud, enclosing the inner imbricate segments. *Corolla-tube* short; lobes 18 or 24, in 2 or 3 series. *Stamens* 6-8, inserted near the base of the corolla and opposite to the lobes of its interior series; filaments short; anthers lanceolate, connective excurrent; staminodes as many as the stamens, alternate with those of the same series or connate with them at the base, entire or variously toothed. *Ovary* hairy, 6-8-celled. *Berry*

globose, few or 1-seeded, endocarp crustaceous. Seed ellipsoid, compressed, albumen fleshy, cotyledons flat.—Species about 30, in the tropical regions of both hemispheres.

*M. hexandra*, Roxb. Cor. Pl. i, 16, t. 15; Fl. Ind. i, 233; F. B. I. iii, 549; Watt E. D.; Kanjilal For. Fl. 219; Gamble Man. Ind. Timb. 450; Cooke Fl. Bomb. ii, 92; *M. indica*, A. DC.; Brand For. Fl. 291; Ind. Trees 425.—Vern. *khirni*.

A handsome evergreen tree, 50-60 ft. high. Trunk erect, the branches forming a large shady head. Bark blackish-grey, deeply furrowed. Leaves 2-4 in. long, obovate or oblong, rounded or emarginate at the apex, cuneate at the base or occasionally rounded or sub-truncate, coriaceous, glabrous on both surfaces, dark-green and shining above, paler beneath; midrib impressed above, prominent beneath; petiole  $\frac{1}{2}$ - $\frac{3}{4}$  in., glabrous. Flowers white, axillary, solitary or in fascicles of 2-6; pedicels stout,  $\frac{1}{2}$ - $\frac{3}{4}$  in., glabrous or nearly so. Calyx-lobes usually 6, about  $\frac{1}{2}$  in. long, ovate, sub-acute, reflexed, usually somewhat rusty-pubescent outside and with ciliate margins. Corolla  $\frac{1}{2}$  in. long; lobes usually 18, in two series, the 6 inner ones oblanceolate, the 12 outer linear. Stamens 6; anthers acute, as long as the filaments. Staminodes 6, alternate with the stamens, more or less denticulate, glabrous. Ovary 12-celled, hairy. Berry  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, olive-shaped, 1-seeded, reddish-yellow when ripe.

Forests in the Kheri district of N. Oudh, apparently wild (Duthie's collector); also in Bundelkhand (Edgeworth). Flowers in Nov. and Dec. DISTRIB.: Cent. and S. India and in the dry region of Ceylon. It is largely cultivated in India, and as far north as Multan and Lahore. The wood is hard, tough and very durable, and is much used for oil presses, house-building and in turnery. The bark is much sought after for medicinal purposes, and trees are often greatly injured thereby. The fruit is eaten, and an oil is extracted from the seeds.

*M. ELENGI*, Linn. Sp. Pl. 349; Roxb.; Fl. Ind. ii, 236; Royle Ill. 263; Brand For. Fl. 293; Ind. Trees 425; F. B. I. iii, 548; Watt E. D. Gamble Man. Ind. Timb. 449; Kanjilal For. Fl. 219; Cooke Fl. Bomb. ii, 92; Prain Beng. Pl. 649. Vern. *Mulsári*.—A large very ornamental glabrous evergreen tree with rough dark-grey bark. It is found wild in S. India, Ceylon, Burma, Martaban, on the Shan Hills and in the Andaman Islands. It is also cultivated at many places within the area, and throughout the hotter parts of India. It differs from *M. hexandra* chiefly in having 8 calyx segments and 8 stamens. The small fragrant star-shaped flowers appear during March and April. These are collected after they have fallen on the ground and are made into garlands; they are also used in native perfumery. The wood is like that of *M. hexandra*, and is used for similar purposes. The bark is much employed in native medicine. The fruit is eaten and from the seeds an oil is extracted.

## LXVII.—EBENACEÆ.

Trees or shrubs. *Leaves* alternate, rarely opposite, exstipulate, entire, usually coriaceous. *Flowers* axillary, usually dioecious, regular, solitary and sub-sessile, or in short usually bracteate cymes, pedicels articulate under the flower. *Calyx* inferior, gamosepalous, often accrescent in fruit, lobes 3-7. *Corolla* gamopetalous; lobes 3-7, generally contorted. *Stamens* as many or 2-3 times as many as the corolla-lobes, hypogynous, free or the filaments paired or variously united; anthers narrow, basifixed, usually dehiscing longitudinally, connective often produced. *Staminodes* in the fem. flower resembling stamens or 0. *Ovary* superior, sessile; styles 2-8; cells as many or twice as many as the styles, imperfectly septate; ovules twice as many as the styles, attached to the inner angle of the cells, pendulous, anatropous. *Fruit* coriaceous or fleshy, indehiscent, 1- or few-seeded. *Seeds* pendulous, testa thin; albumen copious uniform or ruminant.—Species about 250, in the tropics of both hemispheres, a few in S. Africa and in N. America.

## DIOSPYROS, Linn.; Fl. Brit. Ind. iii, 553.

Trees or shrubs. *Leaves* alternate, rarely subopposite. *Flowers* dioecious, very rarely polygamous, axillary and short-pedicelled or in small cymes, sometimes (the females often) solitary, usually 4-5-merous. *Calyx* more or less deeply lobed, rarely truncate, usually accrescent in the female flower. *Corolla* tubular, salver-shaped or campanulate, shortly or deeply lobed; lobes twisted to the right. MALE fl.: *Stamens* 4-many (usually 16); filaments distinct or paired or otherwise united; anthers linear or lanceolate, rarely short; ovary rudimentary. FEM. fl.: *Staminodes* 0-16. *Ovary* globose or conical, 4-10-celled; ovules solitary (rarely 2) in each cell; styles or stigmas 1-4. *Fruit* globose ellipsoid or ovoid-conic, usually supported by the enlarged and sometimes woody calyx, pulp often viscid. *Seeds* oblong, usually compressed, albumen uniform or ruminant.—Species about 180, mostly tropical.

Seeds with ruminant albumen, leaves alternate and subopposite . . .

1. *D. tomentosa*.

Albumen of seeds not ruminant, leaves always alternate:—

Stamens 16, in two rows, unequal:—

Male flowers in small few-flowered panicles, staminodes usually four .

2. *D. montana*.

Male flowers in threes.—

Anthers awned, glabrous, stam-  
inodes usually eight . . . .

3. *D. Kanjilali*.

Anthers not awned, pubescent, sta-  
minodes twelve . . . .

4. *D. cordifolia*.

Male flowers in dense axillary clus-  
ters, anthers glabrous . . . .

5. *D. Chloroxylon*.

Stamens many, in two rows. subequal . . . .

6. *D. Embryopteris*.

1. *D. tomentosa*, Roxb. Hort. Beng. 40; Fl. Ind. ii, 532; Royle III. 262; F. B. I. iii, 564; Watt E.D.; Kanjilal For. Fl. Sch. Circ. 222; Gamble Man. Ind. Timb. 460; Prain Beng. Pl. 654; D. Melanoxylon, Brandis For. Fl. 294 (in part); Ind. Trees 433. *D. exsoulpta*, Buch.-Ham. in Trans. Linn. Soc. xv, 110.—Vern. Tendu, mitha tendu, abnus.

A medium-sized tree with often a very crooked trunk. Bark dark-grey or blackish, exfoliating in rectangular scales. Young parts densely clothed with grey or rusty tomentum. Leaves alternate and sub-opposite, 3-8 in. or more in length, broadly ovate from a rounded or cordate base, glabrous above; the lower surface tomentose, becoming glabrous or nearly so when mature, very coriaceous; main lateral nerves 8-10, impressed on upper surface, prominent beneath; petiole  $\frac{1}{2}$  in. Flowers 4-5-merous, white. MALE flowers in short subsessile drooping cymes. Calyx funnel-shaped, widened at the mouth, teeth ovate,  $\frac{1}{2}$ - $\frac{3}{4}$  in. Corolla fulvous-lanate outside. Stamens 12-16, free, filaments glabrous, anthers mucronate. FEM. flowers solitary, shortly stalked, larger than the males. Calyx 4-5-gonal. Staminodes 8-10 or fewer, sometimes connate in pairs. Ovary hairy, 4-8-celled; styles 2-3. Fruit globose 1-1 $\frac{1}{2}$  in. in diam, glabrous, smooth, yellow when ripe, pulp sweet. Seeds 4-8, compressed, oblong, albumen ruminant.

Sivalik range, chiefly on the southern slopes towards the Jumna, sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur, also in Bundelkhand and Merwara. Flowers in April, and the fruit ripens in June. DISTRIB.: From Bengal and Chota Nagpur to the Cent. Provinces and southwards as far as the Godaveri, also in the Sivalik and sub-Himalayan tracts of the Punjab westwards to the Ravi. The heartwood of old trees constitutes the fine black ebony of Northern India, where, especially in the Bijnor district, it is largely utilized in the manufacture of carved walking-sticks, picture frames and other small articles. The fruit contains a sweetish astringent pulp, which is much eaten by the natives.

2. *D. montana*, Roxb. Cor. Pl. i, 37, t. 48; Fl. Ind. ii, 538; Hiern in Trans. Camb. Phil. Soc. vii, 220, Brand. For. Fl. 296 (in part), Ind. Trees 431 (in part); Watt E.D. (in part); Gamble Man. Ind. Timb. 454 (in

part); Cooke Fl. Bomb. ii, 104; Prain Beng. Pl. 653.—Vern. Neori, bheri (Bundelkhand).

A small or medium-sized tree, sometimes armed. *Trunk* usually crooked covered with dark rust-coloured nearly smooth bark. Young branches softly pubescent. *Leaves*  $2\frac{1}{2}$ –4 in. long, ovate, bluntly acuminate, usually rounded at the base, thinly coriaceous, margins undulate, softly pubescent when young, but finally glabrous on both surfaces, petioles  $\frac{1}{2}$ – $\frac{3}{4}$  in. long. *MALE flowers* in small few-flowered panicles; bracts ovate, acute, ciliate. *Calyx* glabrous outside and inside; lobes 4, ciliate on the margins. *Corolla* about 3 or 4 times as long as the calyx, urceolate, white; lobes shorter than the tube. *Stamens* 16, in opposite pairs, united at the base, the outer longest. *Anthers* lanceolate, awned, glabrous. *FEM. flowers* axillary, solitary, nodding; pedicels stout, shorter than the flowers, bearing 2 small ovate ciliate bracts above the middle. *Calyx* glabrous except the ciliate margins; lobes ovate-oblong, accrescent. *Staminodes* 4. *Ovary* globose, glabrous, 8-celled. *Fruit* globose, about 1 in. in diam., supported by the enlarged reflexed calyx-lobes, reddish-brown.

Bundelkhand (Edgeworth, Mrs. Bell). These are the only specimens I have seen of Roxburgh's *D. montana* from the Upper Gangetic area. Flowers during the hot season. *DISTRIB.*: Behar, Rohilasghur (Wall Cat. 4115), the Circars (Roxburgh), Konkan, Malabar, Belgaum, also in Burma. It is easily distinguished from *D. cordifolia* by the shape and thinness of the leaves, by the male flowers being in panicles, and by the number of the staminodes.

3. *D. Kanjilali*. Duthie in Ind. For. Vol. xxvi (1905) 307; Brandis Ind. Trees 713.

A small or medium-sized tree with a fairly tall trunk. *Bark* greenish or ashy-grey and quite smooth like that of the *Guava*, exfoliating in thin scales. *Branches* forming a rather narrow and open crown, not spinescent. *Leaves*  $1\frac{1}{2}$ – $5\frac{1}{2}$  in. long, elliptic-suborbicular, thicker than those of *D. cordifolia*, usually densely tomentose when young, becoming rigidly coriaceous and almost glabrous in age; midrib impressed above, prominent beneath, petioles  $\frac{1}{2}$ – $\frac{3}{4}$  in. *MALE flowers* in short 3-flowered cymes, pedicels  $\frac{1}{8}$  in.; bracts ovate, sub-acute, ciliate on the margins. *Calyx-lobes* broad and rounded, pubescent on both sides and with ciliate margins. *Corolla*  $\frac{15}{16}$ – $\frac{3}{4}$  in. long, slightly pubescent outside, glabrous within, pale-green. *Stamens* 16, in opposite pairs, united below; anthers awned, glabrous. *FEM. flowers* axillary, solitary, nodding, pedicels about  $\frac{1}{2}$  in. *Calyx* in fruit accrescent; lobes spreading, broader than in *D. cordifolia*. *Corolla* dark-green, otherwise like that of male. *Staminodes* 8, alternately longer, the longer ones often toothed near the acuminate apex, the shorter ones obtuse. *Fruit* up to 1 in. in diam., globose. *Seeds* about  $\frac{1}{2}$  in., sublunate.

Recorded by Kanjilál from Tháno and Lachiwála in Dehra Dun, and from Ránpur, Dholkhand and Bádsháhibágh on the Siwalik range. Flowers during April and May. **DISTRIB.:** Rájpur below Mussoorie at 2-3,000 ft. (Edgeworth, Mackinnon); above Kálsi in Jauasár at 2,500 ft. (Kanjilál); in the Chánda district of the Central Provinces (Duthie); collected also by Gamble in the following localities:—Santál Parganá in Bengal (No. 10614); and in the Madras districts of Ganjam (No. 13657), Anantapur (No. 20873), Bellary (No. 16583); and by Ritchie in N. Kanara (No. 972). This tree has already been alluded to by Kanjilál on p. 221 of his 'Forest Flora.' It appears to occupy a position intermediate between *D. montana* proper and *D. cordifolia*. With the former it agrees in general habit, stature, smoothness of bark and in the absence of spines; but it differs by having thick coriaceous leaves, the male flowers are in threes, and there are twice the number of staminodes. From *D. cordifolia* it may easily be distinguished by its smooth bark, absence of spines, the shape of the leaves, the glabrous awned anthers, and by the number of the staminodes; it also differs by having a more defined trunk with ascending, not spreading, branches. As far as one can judge from herbarium specimens it comes very near Dalzell's *D. Goindu*, but the latter has more acuminate leaves, hairy anthers and a much smaller fruit.

4. *D. cordifolia*, Roxb. *Cor. Pl.* i, 38, t. 50; *Fl. Ind.* ii, 538; Royle *III.* 262; Cooke *Fl. Bomb.* ii, 105. *D. montana*, C. B. Clarke, in *F. B. I.* iii, 555 (in part); Watt *E.D.*; Kanjilál *For. Fl.* 221; Brandis *Ind. Tree* 431 (in part). *D. montana*, var. *cordifolia*, Hiern. in *Trans. Camb. Phil. Soc.* xii, 222; Gamble *Man. Ind. Timb.* 455; Prain *Beng. Pl.* 653.—Vern. *Tendu, bistendu*.

A small tree, with a short often crooked trunk. Bark blackish or dark brown, furrowed with longitudinal and transverse cracks. Trunk and larger branches armed with many stout and often branching spines. Leaves 1½-2½ in. long, oblong obtuse, cordate rounded or subtruncate at the base, softy downy on both surfaces especially when young; petiole ½-¾ in. long. MALE flowers axillary; peduncles 3-flowered, pedicels ⅓ in. long. Calyx ½ in. long, hairy outside; lobes elliptic, obtuse or subacute, pubescent inside and with ciliate margins. Corolla dull-white, ⅓ in. long, hairy outside; lobes ovate-oblong, sub-acute. Stamens in opposite pairs, united below; anthers not awned, pubescent. FEM. flowers solitary, pedicels ½ in. Calyx ½-¾ in., recurved and twisted in fruit; lobes thin, oblong, obtuse. Corolla-lobes obtuse. Staminodes 12, lanceolate, on long filaments. Fruit ½-1 in. in diam., globose, yellow when ripe.

Abundant in many parts of the area especially in the sub-Himalayan tracts. Flowers in the hot season. **DISTRIB.:** Throughout tropical India, extending to Ceylon, Burma and N. Australia. Every part of this tree has a bitter taste, including the fruit, which has also a most unpleasant smell.

5. **D. Chloroxylon**, Roxb. *Cor. Pl.* i, 38, t. 49; *Fl. Ind.* ii, 538; Hiern in *Trans. Camb. Phil. Soc.* 233; Brand. *For. Fl.* 297; *Ind. Trees* 430; *F.B.I.* iii, 560; Watt *E. D.*; Gamble *Man. Ind. Timb.* 458; Cooke *Fl. Bomb.* ii, 105; Prain *Beng. Pl.* 653.

A large shrub or medium-sized tree, sometimes spinescent. Bark deeply cracked. Young parts tomentose. Leaves alternate, 1-2½ in. long, elliptic or obovate oblong, obtuse, or sub-acute at both ends, more or less pubescent above, rusty-tomentose beneath, nerves obscure; petiole about ½ in., densely hairy. Inflorescence fulvous-pubescent. Flowers white, 4-merous. MALE flowers 4-10, in subsessile clusters; bracts small, elliptic. Calyx subglobose, 1½ in. long, ovate, rounded, apiculate, densely hairy outside, glabrous inside. Corolla ¼ in., urceolate; lobes acute, hairy outside. Stamens 16, in two rows, the inner one smaller. FEM. flowers solitary, sessile. Calyx and corolla larger than those of male flower. Stamminodes 7-9, glabrous. Ovary 8-celled, glabrous; styles 4. Fruit globose, ½ in. in diam., 2-3-seeded, glabrous, fruiting calyx nearly flat.

Bahraich district of N. Ondh (Duthie's collector). Flowers during the hot season. DISTRIB. Central and S. India. The yellowish wood is said to be hard and durable.

6. **D. Embryopteris**, Pers. *Syn.* ii, 624; Royle *Ill.* 262; Hiern in *Trans. Camb. Phil. Soc.* 257; Brand. *For. Fl.* 298; *Ind. Trees* 434; *F. B. I.* iii, 556; Watt *E. D.*; Kanjilal *For. Fl. Sch. Circ.* 221; Gamble *Man. Ind. Timb.* 455; Cooke *Fl. Bomb.* ii, 106; Prain *Beng. Pl.* 653; *D. glutinosa*, Koen. ex Roxb. *Fl. Ind.* ii, 533.—Vern. Gáb, kála tendu, kusi (Bundelkhand).

A medium-sized tree, with many spreading branches forming a compact shady head, quite glabrous except the young parts and the inflorescence. Bark dark-grey or greenish-black, exfoliating in large pieces. Leaves distichous, spreading, 4-11 in. long and 1¼-3 in. wide, oblong or oblong-lanceolate, obtuse or bluntly acuminate, rounded at the base, coriaceous, dark-green, (crimson when young), glabrous and shining; petiole ½ in. long, wrinkled. Flowers 4-merous, white or cream-coloured, sweet-scented. MALE flowers 2-7, in short-peduncled drooping rusty pubescent racemose cymes. Calyx ¼ in. long, clothed outside with appressed silky hairs; lobes ¼-½ in., triangular, pubescent inside. Corolla ½ in. long, tubular-campanulate; lobes thick, rounded at the apex. Stamens usually about 40, in pairs at the base of the corolla-tube or on the receptacle beneath, subequal; filaments short, hairy; anthers linear, with a line of hairs up the middle. FEM. flowers larger than the male, usually solitary, drooping. Calyx broadly ovate, subcordate at the base, much enlarged in fruit. Corolla-lobes cordate, obtuse, recurved. Stamminodes 1-12 (often only 4). Ovary 8-celled, glabrous; styles 4, stigma lobed. Fruit 1-2½ in. in diam., subglobose, covered with deciduous rusty-coloured scurf, yellow when ripe. Seeds 4-8, embedded in glutinous pulp, compressed, smooth, reddish-brown.

Dehra Dun, usually in swampy ground or beside streams; Sub-Himalayan tracts eastwards from Dehra Dun; also in Bundelkhand. Flowers March to May and the fruit ripens during the cold season. **DISTRIB.** Throughout the greater part of India, but not found in Assam, E. Bengal, Pegu, nor in the drier tracts of Bombay, the Panjab and Sindh. This is a very handsome tree at all times, but especially so when the young crimson foliage appears amongst the older dark-green leaves. The viscid pulp of the fruit is used in bookbinding, and instead of tar for caulking the seams of boats. Fishing nets and lines are said to be rendered more durable after being steeped in an infusion of the astringent fruit. The unripe fruit and bark are used medicinally.

### LXVIII.—STYRACEÆ.

Trees or shrubs. *Leaves* alternate, simple, exstipulate. *Flowers* regular, hermaphrodite (in the Indian species), usually white, arranged in axillary or terminal, simple or compound racemes or spikes; bracts small or obsolete. *Calyx* campanulate, tube more or less adnate to the ovary; limb 5 (rarely 4)-lobed, or truncate, persistent. *Corolla* usually 5-partite; segments almost free, imbricate (in the Indian species). *Stamens* adnate to the petals, twice as many or indefinite, those of the outer series longer, filaments free or connate, anthers round or linear. *Ovary* more or less inferior, 2-5-celled, style filiform or rather thick; stigma capitate, entire or obscurely lobed; ovules 2, pendulous from the inner angle of each cell. *Fruit* drupaceous, 1 (rarely 2-3)-seeded. *Seeds* albuminous, embryo straight or curved.—Species about 350, found in the warmer regions of Asia, Australia and America.

#### 1. SYMPLOCOS, Linn.; Fl. Brit. Ind. iii, 572.

This genus may easily be distinguished from all the other genera of *Styraceæ* by having numerous stamens arranged in many series.—Species upwards of 280, in the warmer regions of Asia, Australia and America.

Flowers white, distinctly pedicelled	.	.	1. <i>S. cratægoides</i> .
Flowers yellow, sessile or nearly so	.	.	2. <i>S. racemosa</i> .

1. *S. cratægoides*, Buch.-Ham. ex Don Prod. 145; Brandis For. Fl. 299; P. B. I. iii, 573; Watt E. D.; A. Brand. (*Symploc.*) in Engl. Pflanzenreich 33; Kanjilál For. Fl. Sch. Circ. N. W. P. 223; Gamble Man. Ind. Timb. 464; Collett Fl. Siml. 305. *S. paniculata*, Wall.; Royle Il. 261. *Lodhra cratægoides*; Jacquem. Voy. Bot. 103, t. 110.—Vern. Lodh., ludh.



A large shrub or medium-sized tree. Young branches more or less pilose. Leaves membranous, 2-4 in. long, elliptic or ovate-elliptic, acute or acuminate, rounded or cuneate at the base, usually deeply serrate towards the apex, under surface usually pilose especially on the midrib, but sometimes quite glabrous, nerves prominent beneath, petiole  $\frac{1}{2}$  in. long. Flowers pedicelled, white turning to yellow, fragrant, arranged in cymose corymbs on elongate terminal and axillary panicles, those of the lateral branches often few and with longer pedicels; bracts small, linear, caducous. Calyx-tube obconic, glabrous or more or less pilose; lobes rounded or lanceolate and acute, ciliate. Corolla three times longer than the calyx, 5-part. Stamens 20-60, equalling the corolla in length; filaments connate in 5 bundles. Ovary usually 2-celled, glabrous or hairy. Fruit  $\frac{1}{2}$ - $\frac{3}{4}$  in., globose or ovoid, crowned with the remains of the calyx-limb, black when ripe.

Dehra Dun, in swamps (Kanjilal). DISTRIB. Abundant on the Himalaya up to 9,000 ft. from the Indus to Assam and on the Khasia hills, also in Upper and Lower Burma. The hawthorn-like flowers appear during May and June. The flowers and leaves are much used in native dyeing, the bark is medicinal, and the leaves afford fodder for sheep and goats.

2. *S. racemosa*, Roxb. Hort. Beng. 40; Fl. Ind. ii, 539; Royle Ill. 260; Brandis For. Fl. 300; F. B. I. iii, 576; Watt. E. D.; A Brand. (Symploc.) in Engl. Pflanzenreich 59; Gamble Man. Ind. Timb., 465; Prain Beng. Pl. 655. *S. Hamiltoniana*, Wall.; Brandis For. Fl. 301.—Vern. Lodh.

A small tree, or often only a shrub. Branchlets glabrous or sparingly pilose. Leaves 2-7 in. long, elliptic-oblong or oblong-lanceolate, rounded or obtusely acuminate at the apex, rounded or cuneate at the base serrulate or obscurely crenate, coriaceous, glabrous above, sparsely pilose on the midrib beneath, nerves indistinct, petiole  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. Flowers sessile or nearly so, yellow, fragrant, on short axillary compound spikes; bracts unequal, ovate, hairy, deciduous. Calyx-tube, glabrous; lobes rounded, equalling the tube, slightly pubescent and with ciliate edges. Corolla 3 times longer than calyx. Stamens often exceeding one hundred. Ovary 3-celled, hairy. Fruit oblong or cylindrical, 1-3-celled.

Pâtli dun and Kumaon bhābar; also in the forests of Bahraich and Gonda in N. Oudh (R. Thompson and Duthie's collectors). DISTRIB. Eastwards to Assam and Chota Nagpur; also in Upper Burma, the Andaman Islands and in China. The bark and leaves are used in dyeing, and the bark is medicinal.

## LX X.—OLEACEÆ.

Trees, or scandent or erect shrubs, unarmed. Leaves opposite rarely alternate, simple 3-foliate or pinnate, entire or toothed; stipules 0. Flowers regular, often dimorphous, hermaphrodite or

sometimes polygamous or dioecious, arranged in terminal or axillary trichotomous cymes or panicles, rarely fascicled or racemose. *Calyx* small, truncate or 4-or more-lobed. *Corolla* monopetalous, rarely 4-9-petalous or 0; tube long or short; lobes imbricate or valvate in bud. *Stamens* 2 (in the Indian species), inserted on the corolla, or (in the polypetalous or apetalous genera) hypogynous, filaments usually short, anthers oblong. *Ovary* free, 2-celled, *stigma* simple or 2-lobed; *ovules* usually two in each cell, attached to the inner angle near the apex or base. *Fruit* a loculicidal capsule, or a berry or drupe. *Seeds* solitary or two in each cell, erect or pendulous, albumen fleshy horny or 0, embryo straight, radicle inferior or superior.—Species about 280, in tropical and temperate regions.

Corolla-lobes imbricate in bud, usually more than four.

Fruit a berry, 2-lobed or (by abortion) simple.—Usually scandent shrubs with simple or compound leaves . . . . 1. JASMINUM.

Fruit a flattened capsule.—A large shrub or small tree with simple leaves . . . . 2. NYCTANTHES.

Fruit an obovoid capsule.—A tree with compound leaves . . . . 3. SCHREBERA.

Corolla-lobes valvate in bud, not more than four, leaves simple.

Petals nearly free or connate in pairs . . . . 4. LINOCIERA.

Petals connate in a short tube or sometimes absent . . . . 5. OLEA.

### 1. JASMINUM, Linn. ; Fl. Brit. Ind. iii, 591.

Shrubs, erect or scandent. *Leaves* opposite, rarely alternate, simple-3-foliate or imparipinnate. *Flowers* usually fragrant, arranged in terminal or axillary cymes, rarely solitary. *Calyx* 4-9-fid. or partite. *Corolla* salver-shaped, white pink or yellow, tube narrow; lobes 4-10 or more, spreading, imbricate in bud. *Stamens* 2, not exserted, filaments very short, anthers attached near their bases on the back, connective usually mucronate. *Ovary* 2-celled; *style* cylindric, short; *stigma* simple or 2-lobed; *ovules* 2 in each cell, attached near the base. *Berry* didymous, or by suppression simple; *carpels* globose ellipsoid or elongate. *Seeds* usually solitary in each.

carpel, erect, exalbuminous, radicle inferior.—Species about 90, inhabiting Asia, Africa and Australia, and one is indigenous in S. Europe.

Leaves simple

Leaves ovate, calyx densely pubescent.

Flowers sessile, or subsessile, in compact cymes.—A scandent shrub . . . 1. *J. pubescens*.

Flowers pedicelled, in lax cymes.—A large erect or scandent shrub . . . 2. *J. arborescens*.

Leaves narrowly lanceolate or elliptic, calyx glabrous or nearly so.—An erect shrub . . . 3. *J. brevipetiolatum*.

Leaves imparipinnate.—A climbing shrub . . . 4. *J. dysrrhynchum*.

1. *J. pubescens*, Willd. *Sp. Pl.* i, 37; Roxb. *Fl. Ind.* (ed. Carey & Wall.) i, 90; Don *Prod.* 105; F. B. I. iii, 592; Watt *E. D.*; Kanjilál *For. Fl.* 225; Gamble *Man. Ind. Timb.* 468; Prain *Beng. Pl.* 659; Cooke *Fl. Bomb.* ii, 112. *J. hirsutum*, Willd.; Brandis *For. Fl.* 312.—Vern. *Chameli, kunda*.

A scandent shrub. Branchlets and young parts densely fulvous-tomentose. Leaves opposite, simple, ovate, acute or mucronate, blade  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. long by 1-2 in. broad, base rounded or cordate, softly pubescent on both surfaces especially on the veins beneath, finally subglabrous above; main lateral nerves 4-6 pairs; petiole  $\frac{1}{4}$ - $\frac{3}{8}$  in., densely tomentose. Flowers sessile or nearly so, white, fragrant, in dense terminal capitate corymbose cymes, or terminating the short axillary branches. Calyx about  $\frac{1}{2}$  in. long, densely fulvous-tomentose; teeth linear,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. Corolla glabrous, tube a little longer than the calyx; lobes oblong-lanceolate, acute or mucronate, shorter than the tube. Carpels 1-2, globose,  $\frac{1}{4}$  in. in diam., surrounded by the calyx-teeth, black when ripe.

Dehra Dun, Siwalik range and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers December to April, and usually to some extent during the rainy season. DISTRIB. Throughout the greater part of India, ascending to 3,000 feet on the Himalaya, also in Burma and China. It is largely cultivated in gardens as an ornamental shrub.

2. *J. arborescens*, Roxb. *Hort. Beng.* 3; *Fl. Ind.* (ed. Carey & Wall.) i, 94; Brandis *For. Fl.* 311; F. B. I. iii, 594; Watt *E. D.*; Kanjilál *For. Fl.* 225; Gamble *Man. Ind. Timb.* 467; Cooke *Fl. Bomb.* ii, 112; Prain *Beng. Pl.* 653.—Vern. *Chameli, bara kunda*.

A large suberect or scandent shrub with hairy branchlets. Leaves opposite, simple, entire; blade 3-5 in. long by 2-3 in. broad, ovate, acute or shortly acuminate, truncate rounded or subcordate at the

base, softly tomentose when young, at length glabrous, main lateral nerves 6-8 pairs; petiole  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. *Flowers* pedicelled, white, fragrant, arranged in lax 3-ctotomous terminal hairy cymes; bracts linear, about as long as the pedicels. *Calyx-teeth*  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, linear or subclavate, hairy. *Corolla* glabrous, tube about  $\frac{1}{2}$  in. long; lobes usually 9,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, linear-lanceolate, acute or acuminate. *Carpels* usually solitary,  $\frac{1}{2}$  in. long; ellipsoid, black when ripe.

Western portion of Dehra Dun and along the southern side of the Siwalik range, also in the submontane tracts of Rohilkhand and N. Oudh. Flowers during April and May. *DISTRIB.* Bengal, Cent. and S. India, ascending to 3,000 feet on the Himalaya. The scandent form (Roxburgh's *J. latifolium*) is also found in Dehra Dun and in other parts of the area. It differs in no other respect from the type.

**3. *J. brevipetiolatum*, Duthie in Brandis Indian Trees, p. 450.**

A shrub or small tree. Young parts and branches of inflorescence sparingly pubescent. *Stems* obtusely quadrangular, smooth. *Leaves* simple, opposite or subopposite shortly petioled; blade 2-4 $\frac{1}{2}$  in. long narrowly lanceolate or elliptic-lanceolate, acute or acuminate, subcoriaceous and quite globose; margins entire, slightly recurved, midrib stout and prominent beneath; main lateral nerves 8-10 pairs, slender, forming intermarginal loops; petiole about  $\frac{1}{4}$  in. long. *Flowers* white, arranged in lax terminal corymbose or paniced cymes; pedicels about  $\frac{1}{4}$  in. long; bracts much shorter than the pedicels, lanceolate-acuminate. *Calyx*  $\frac{1}{2}$  in. long, almost glabrous, tube subhemispheric; teeth about as long as the tube, elongating in fruit, linear or subclavate, thick. *Corolla*  $\frac{3}{4}$  in. long, tube twice as long as the narrowly elliptic obtuse lobes. *Fruit* oval, about  $\frac{1}{2}$  in. long, dark purplish-brown when ripe.

Forests in the Pilibhit district of Rohilkhand and in the Kheri district of N. Oudh (Duthie's collector). Flowers in May. This species is very near *J. laurifolium*, Roxb., but differs from it by the much shorter and thicker calyx-lobes and by the shorter and broader corolla-lobes.

**4. *J. dispernum*, Wall. in Roxb. Fl. Ind. i (1820) 99; Pl. As. Rar. iii, 46, t. 274; Don. Prod. 106; Brand. For. Fl. 312; F. B. I. iii, 602; Kanjilál For. Fl. 226; Collett Fl. Siml. 307.**

A glabrous climbing shrub. *Branches* divergent, slender, 4-angular. *Leaves* opposite, imparipinnate, or the upper ones often unifoliate; leaflets usually 3-5, lanceolate or ovate-lanceolate, entire, cordate and 3-nerved at the base and with a long slender acuminate apex; terminal leaflet with a long stalk, the blade 3-4 $\frac{1}{2}$  in. long; lateral smaller, shortly stalked or sessile. *Flowers* many, white or pink, in elongate terminal panicles, or few together in rather dense axillary cymes; bracts minute, pedicels 0- $\frac{1}{2}$  in. long. *Calyx* glabrous or minutely puberulous; teeth very short, triangular. *Corolla-tube* about  $\frac{1}{2}$  in. long; lobes ovate or broadly elliptic, shorter than the tube. *Carpels* 2-seeded,  $\frac{1}{2}$  in. long, ellipsoid, dark purple when ripe.

Dehra Dun, in shady ravines. Flowers May and June. **DISTRIB.** Temperate Himalaya from Kashmir to Bhutan up to 8,000 feet; also on the Khasia Hills.

The following species are cultivated within the area:—

- Jasminum Sambac*, Ait. (Arabian or Tuscan Jasmine). An erect or subscandent shrub, very much cultivated in gardens. The fragrant white flowers are sacred to Vishnu, and are largely used by the Hindus for making into garlands. This shrub is believed to be indigenous in S. India.
- Jasminum humile*, L. An erect shrub with alternate 3-foliolate or pinnate leaves and bright yellow flowers. Wild on the W. Himalaya up to 9,000 feet, also on the Salt Range, and on Mt. Abu in Rajputana. Cultivated within the area and in other parts of India.
- Jasminum officinale*, L. (common white Jasmine). A large scandent shrub with opposite imparipinnate leaves and fragrant white flowers. Wild in Kashmir, Afghanistan and Persia, and apparently so on the Salt Range.
- Jasminum grandiflorum*, L. (Spanish Jasmine). A large subscandent shrub with opposite imparipinnate leaves. The very fragrant flowers larger than those of *J. officinale*, are white and streaked with pink outside. It is wild on the W. Himalaya up to 7,000 feet, and is extensively cultivated in gardens within the area. The flowers are much used by the natives for making into garlands.

## 2. NYCTANTHES, Linn.; Fl. Brit. Ind. iii, 603.

Shrubs or small trees. *Leaves* opposite, ovate, entire or toothed. *Flowers* sessile, in small peduncled and bracteate heads disposed in terminal trichotomous cymes. *Calyx* ovoid-cylindric, subtruncate, finally splitting or deciduous. *Corolla* salver-shaped, tube cylindric, orange-coloured, lobes 4-8, imbricate in bud, spreading, white. *Anthers* 2, subsessile near the top of the corolla-tube. *Ovary* 2-celled; style cylindric, very shortly bifid; *ovules* 1 in each cell, erect, basal. *Capsule* orbicular, dorsally compressed, separating when ripe into 2 subdiscoid 1-seeded carpels. *Seed* erect, orbicular, flattened, testa thin, albumen 0, cotyledons flat, radicle inferior.—Species 2, one Indian and another in Sumatra.

**N. Arbor-tristis**, Linn. *Sp. Pl.* 6; *Roxb. Fl. Ind.* (ed. Carey & Wall.) i., 85; *Royle Ill.* 268; *Brandis For. Fl.* 314; *F. B. I.* iii, 603; *Watt E. D.*; *Kanjilâl For. Fl.* 227; *Gamble Man. Ind. Timb.* 469; *Collett Fl. Siml.* 303; *Prair Beng. Pl.* 660; *Cooke Fl. Bomb.* ii, 115.—Vern. *Harsingâr; kurri* (Dehra Dun).

A shrub or small tree with rough 4-angular branches. *Leaves* petioled, 4-5 in. long by 2-2½ in. wide, ovate, acute or acuminate, base rounded

or cuneate; upper surface scabrous with bulbous-based hairs, pubescent beneath, margin slightly recurved, entire or with distant teeth, principal nerves conspicuous beneath. *Flowers* very fragrant, bracts ovate or suborbicular, apiculate, hairy. *Calyx*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, hairy outside, glabrous within. *Corolla*-tube  $\frac{1}{2}$  in. long, limb about as long as the tube, 5-8-lobed, lobes obovate. *Capsule*  $\frac{1}{2}$ - $\frac{3}{4}$  in. in length and breadth, glabrous, emarginate at the apex.

Forests of Dehra Dun and of the Siwalik range, and in the Sub-Himalayan tracts of Rohilkhand and N. Oodh; also in Bundelkhand. *Flowers* August to October. *DISTRIB.* Ascends to 5,000 feet on the outer Himalayan ranges from the Chenab to Nepal, extending eastwards to Assam and Bengal, and southwards through Central India as far as the Godavari; found also in Burma. The fragrant flowers, which open during the night and fall to the ground in the early morning, are made into garlands and used in Hindu ceremonies. They are also collected for the preparation of an orange-coloured dye yielded by the tubes of the corollas. The rough leaves are employed for polishing wood and also medicinally. The wood affords excellent fuel.

### 3. SCHREBERA, Roxb.; Fl. Brit. Ind. iii, 604.

Glabrous trees with opposite imparipinnate leaves. *Flowers* in terminal 2-3-chotomous cymes, bracts small. *Calyx* tubular-campulate, truncate or unequally 4-6-lobed. *Corolla* salver-shaped, tube cylindric; lobes 4-7, imbricate, spreading. *Stamens* 2, attached near the top of the corolla-tube; filaments short, anthers included or slightly exserted. *Ovary* 2-celled, style cylindric, stigma shortly 2-lobed; ovules 3-4 in each cell, pendulous. *Capsule* obovoid, 2-celled, loculicidally 2-valved, woody. *Seeds* pendulous, winged, albumen 0; cotyledons plano-convex or contorted, radicle superior.—Species 4, one Indian and three in Africa.

*S. swietenoides*, Roxb. *Cor. Pl. ii, i. t. 101*; *Fl. Ind. i (1820), 109*; *Brandis For. Fl. 305*; *Watt E. D. ; Fl. B. I. iii, 604*; *Prain Beng. Pl. 660*; *Cooke Fl. Bomb. ii, 116*.—Vern. *Moka, ghanta* (Bundelkhand).

A medium-sized tree, 40-50 feet high, with grey scabrous bark; young parts pubescent. *Leaves* deciduous, common petiole 2-3 in. long; leaflets 7-9, opposite, glabrous when mature, the lowest pair smaller; blade 2-4 in. long, ovate or ovate-lanceolate, bluntly acuminate, base often oblique; main lateral nerves 6-8 pairs. *Cymes* 3-6 in. long and about as wide, many-flowered; bracts small, linear, pubescent. *Flowers* shortly pedicelled, fragrant. *Calyx*  $\frac{1}{2}$  in. long, pubescent, limb irregularly 4-6-toothed or subtruncate. *Corolla*  $\frac{1}{2}$  in. long, white with elevated brown glandular dots on the inner surface of the elliptic-

oblong ciliate lobes. *Capsule* pendulous, 2 in. long, pearshaped, hard and woody, surface rough with white raised specks. *Seeds* 3-4 in each cell.

Forests of Bundelkhand and Merwára. Flowers February-April, fragrant at night. **DISTRIB.** Subtropical Kumaon up to 1,500 feet, N. Bengal, Chota Nagpur and from the Central Provinces to the drier parts of S. India; also in Upper Burma. The grey close-grained wood is largely used in turnery.

#### 4. *LINOCIERA*, Swartz; Fl. Brit. Ind. iii, 607.

Shrubs or trees. *Leaves* opposite, entire. *Flowers* in axillary (rarely terminal) panicles or cymes, often in small terminal fascicles, bracts small. *Calyx* small, 4-fid. *Petals* 4, nearly free, or cohering in pairs, or shortly connate, induplicate-valvate in bud. *Stamens* 2, filaments short, attached at the base of the petals. *Ovary* 2-celled, style short, stigma obscurely bifid or entire; ovules 2 in each cell, pendulous. *Drupe* ellipsoid; endocarp bony or crustaceous. *Seed* usually solitary, pendulous, testa thin, albumen fleshy or 0, radicle superior.—Species about 40, in the tropics of both hemispheres.

*L. intermedia*, var. *Roxburghii*, Clarke in F. R. I. iii, 609; Watt E. D.; Cooke Fl. Bomb. ii, 117; Prain Beng. Pl. 660. *Olea paniculata*, Roxb. Hort. Beng. 80; Fl. Ind. i (1920), 104 (not of R. Br.).

Usually a small tree, the branches covered with white lenticels. *Leaves* (including petiole) 3½-5 in. long by 1-1½ in. wide, elliptic or oblanceolate, acute or bluntly acuminate, papery, glabrous, nerves prominent beneath; petiole ½-1 in. long. *Flowers* white, in axillary or extra axillary rather dense thyrsoid panicles, which become lax after flowering; bracts falcate-lanceolate, equalling or exceeding the pedicels. *Calyx* ⅙ in long, glabrous, lobes ovate. *Corolla-lobes* linear-oblong, cohering by pairs at the base. *Ovary* glabrous, stigmatic lobes divaricate. *Drupe* about ½ in. long, ellipsoid, 1-seeded, purple when ripe. Seed exalbuminous.

Kánsrao on the Dohra Dun Siwalik range (Edgeworth), and in the Sub-Himalayan tracts of Kheri and Gonda in N. Oudh. **DISTRIB.** Chota Nagpur, Cent. and S. India.

#### 5. *OLEA*, Linn.; Fl. Brit. Ind. iii, 611.

Trees or shrubs. *Leaves* opposite, entire or toothed. *Flowers* small, hermaphrodite diœcious or polygamous, in axillary or extra-axillary (rarely terminal) panicles, bracts minute. *Calyx* small, 4-toothed or lobed. *Corolla-tube* short lobes 4, induplicate-valvate,

or none. *Stamens* 2, adnate to the corolla-tube or (in the male-flowers) sub-hypogynous; filaments short, anthers oblong. *Ovary* 2-celled; style short, stigma capitate or bifid; ovules 2 in each cell, subpendulous or attached laterally to the septum. *Drupe* ellipsoid or subglobose, endocarp bony or crustaceous, usually 1-seeded. *Seed* pendulous, albumen fleshy, radicle superior.—Species about 35, from the Mediterranean region to S. Africa and from India to Australia and Polynesia.

*O. glandulifera*, Wall. Cat. 2811; Brandis For. Fl. 309; (excl. syn.); F. B. I. iii, 612; Kanjilál For. Fl. Sch. Circ. 230; Gamble Man. Ind. Timb. 474; Collett Fl. Siml. 309.—Vern. Gair.

A small or moderate-sized tree, branches lenticellate. *Leaves* 3-5 in. long by  $1\frac{1}{2}$  in. wide, ovate-lanceolate, with a slender or sometimes abruptly acuminate apex, entire, glabrous, base cuneate, margins undulate; main lateral nerves slender, with glands in the axils on either side of midrib, petiole  $\frac{1}{2}$ -1 in. long. *Flowers* small sessile or shortly stalked, creamy white, in terminal or occasionally lateral 3-achotomous cymes. *Calyx* 4-toothed. *Corolla* deeply divided; lobes  $\frac{1}{5}$ - $\frac{1}{4}$  in. long, elliptic, valvate. *Anthers* large. *Ovary* glabrous or nearly so. *Drupe*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, obliquely ovoid, acute, black when ripe, endocarp bony.

Dehra Dun at Sahánsradhára (Royle), and in the Mothronwala swamp (Kanjilál). *Flowers* April and May. *DISTRIB.* Outer Himalaya from Kashmir to Nepal up to 6,000 feet, also on the Nilgiri Hills and in Ceylon. The reddish grey wood is hard and durable and is used in turnery and for agricultural implements. The bark is medicinal, and the leaves are used as fodder.

*O. cuspidata*, Wall. Cat. 2817; Brandis For. Fl. 307, t. 38; F. B. I. iii, 611; Watt, E. D.; Kanjilál For. Fl. 229; Collett Fl. Siml. 309; Cooke Fl. Bomb. ii, 119. *O. ferruginea*, Royle Ill. 257 t. 65, f. 1; Brandis For. Fl. 576; Gamble Man. Ind. Timb. 474.—Vern. *Kau, kahi* (Indian Olive).—Cult. in Dehra Dun, but quite wild on the W. Himalaya as far west as Kumaon ascending to 6,000 feet, also in Sindh, on the Punjab Salt Range and on the hills of the N.-W. Frontier Province. Allied to the common olive (*O. europæa*). It flowers in April and May and the fruit ripens August-November. The oil extracted from the fruit of this tree is of good quality, but the quantity at present obtainable is unremunerative. Sir D. Brandis suggests that by grafting or by other means the yield may eventually be improved. Mr. Gamble remarks that the wood, which is often prettily marbled, might be worth trying as a substitute for box, or for the wood of the European Olive for inlaying work.

*OLEA EUROPEA*. Linn. is the Olive-tree of S. Europe. The attempts hitherto made to cultivate this tree in India for its oil have not been successful. Although it often grows to a considerable size in N. India it rarely flowers and never produces any fruit.



## LXX.—SALVADORACEÆ.

Shrubs or trees, usually glabrous, armed or not. *Leaves* opposite, entire; stipules minute or 0. *Flowers* small, clustered or paniced, hermaphrodite or dioecious. *Calyx* fræe, campanulate or ovoid, 3-4-toothed or 4-fid. *Corolla* shortly campanulate or the petals fræe, 4-merous, imbricate in bud. *Stamens* 4, inserted on the corolla-tube, or hypogynous, alternate with the lobes or petals; filaments free or connate at the base. *Ovary* superior, 1-2-celled, style short, stigma 2-fid. or subentire; ovules 1-2 in each cell, erect from its base. *Berry* or drupe usually 1-seeded. *Seed* erect, globose or compressed, exalbuminous.—Species 8 or 9, in tropical and subtropical Asia and Africa, also in Madagascar and Malaya.

**SALVADORA**, Linn.; Fl. Brit. Ind. iii, 619.

Unarmed shrubs or trees. *Leaves* usually pale green. *Flowers* sessile or pedicelled, on the branches of axillary or terminal panicles, *Calyx* campanulate, 4-fid. *Corolla* campanulate, tube short; lobes 4, obtuse. *Stamens* 4, attached to the base or middle of the corolla filaments somewhat flattened. *Disk* of 4 scales or glands alternating with the filaments or 0. *Ovary* 1-celled, style very short or 0, stigma broad; ovule solitary, erect. *Drupe* globose, supported by the enlarged calyx and subpersistent corolla, endocarp crustaceous. *Seed* globose.—Species 2, in E. Africa, Arabia and India.

Flowers pedicelled	:	:	:	:	:	1. <i>S. persica</i> .
Flowers sessile	.	.	.	.	.	2. <i>S. oleoides</i> .

1. *S. persica*, Linn. Sp. Pl. 122; Royle Ill. 319; Brand. For. Fl. 315; F. B. I. iii, 619; Watt E. D.; Gamble Man. Ind. Timb. 476; Prain Beng. Pl. 663; Cooke Fl. Bomb. ii, 121. —Vern. Kharjâl:

An evergreen shrub or small tree, with usually a short and crooked trunk. *Branches* many, drooping, terete, glabrous, whitish-yellow. *Leaves* fleshy, glaucous; blade 1-2 in. long and up to 1½ in. wide, elliptic-lanceolate or ovate, obtuse or often mucronate at the apex, base cuneate or rounded; petiole ½-¾ in. long. *Flowers* greenish-yellow, in lax compound panicles; pedicels ¼-½ in. long; bracts ovate, a little shorter than the pedicels, deciduous. *Calyx* ⅓ in. long, glabrous, lobes rounded. *Corolla* twice as long as the calyx, thin, persistent; lobes oblong, reflexed. *Stamens* exserted. *Drupe* globose, ½ in. in diam. smooth, red when ripe.

In the drier western and southern outskirts of the area in the neighbourhood of Delhi, Agra, Muttra and Ajmer, and on the banks of the

Ganges as far east as Patna, especially on saline soils. It is often found growing with *Capparis aphylla* and *Prosopis spicigera*. Flowers November-May. **DISTRIB.** Baluchistán, Sindh, Rájputána and in the coast regions on both sides of the Peninsula and in Ceylon, extending to W. Asia, Abyssinia and Egypt. Often planted near Mahomedan tombs. It is believed to be the Mustard-tree of Scripture. The pungent leaves are eaten as salad, and camels are very fond of browsing on the foliage. The bark of the roots acts as a vesicant. The bitter aromatic fruit is used medicinally, and the twigs are much used by natives for cleaning the teeth, the tree being known as the 'tooth-brush' tree.

2. *S. oleoides*, *Dcne. in Jacquem. Voy. Bot. 140, t. 144; Brandis Fl. R. 316, t. 39; F. B. I. iii. 620; Watt E. D.; Cooke Fl. Bomb. ii, 122; Gamble Man. Ind. Tumb. 477. S. indica, Royle Ill. 319.*—Vern. *Jhál, jál.*

An evergreen shrub or small tree, with usually a short and twisted trunk. Branches many, spreading, whitish. Leaves  $1\frac{1}{2}$ -3 in. long and up to  $\frac{1}{2}$  in. wide, linear lanceolate or ovate-lanceolate, acute or subobtuse and often mucronate, pale-green or glaucous, coriaceous, glabrous. Flowers sessile, greenish-white, in erect axillary panicle spikes; bracts minute, ovate, acute, deciduous. Calyx about  $\frac{1}{2}$  in. long, divided about  $\frac{1}{2}$  way down into 4 rounded lobes. Corolla slightly exceeding the calyx; lobes obovate-oblong, reflexed. Stamens exserted. Drupe globose,  $\frac{3}{8}$ - $\frac{1}{2}$  in. in diam., yellow when ripe.

Confined to the dry and usually saline tracts of the western portion of the area, and often found growing in company with *S. persica*, from which at a distance it may be distinguished by its more sombre green foliage. Flowers January-April. **DISTRIB.** Common in Gujarát, Sindh, Rájputána and in the drier parts of the Punjab and on the Salt Range up to 2,400 feet, extending to Afghanistan and Aden. The sweet fruit (*pilu*) is eaten, especially in times of scarcity. Camels are fond of browsing on the leaves and shoots, but no other animal will eat them.

## LXXI.—APOCYNACEÆ.

Trees, erect or twining shrubs, or herbs. Leaves simple, opposite or whorled, rarely alternate, exstipulate. Flowers in terminal or axillary cymes, regular, hermaphrodite; bracts small. Calyx inferior; lobes 5, rarely 4, imbricate, often glandular within at the base. Corolla usually rotate or salver-shaped; lobes 5, rarely 4, spreading contorted and often twisted in bud, rarely valvate. Stamens 5, rarely 4, inserted usually on the tube of the corolla; filaments usually short, anthers linear-oblong or sagittate, conniving, connective sometimes adhering to the stigma; cells 2, dehiscing longitudinally, some times produced downwards as empty spurs;

\*pollen granular. *Disk* annular, cupular, or of scales, sometimes concealing the ovary, or 0. *Ovary* 1-celled, with 2 parietal placentas, or 2-celled with axile placentas, or of 2 distinct or partially connate carpels, style simple or divided at the base only, thickened at the top; stigma 2-fid, obtuse or acute; ovules few or many in each carpel. *Fruit* a berry drupe or samara, or of 2 baccate or follicle-like mericarps. *Seeds* various, often with a tuft of hairs at one or both ends or winged; albumen hard or fleshy, or scanty or 0; embryo straight. Cotyledons flat or contorted.—Species over 900, chiefly tropical.

Anthers included, free from the stigma, cells with rounded bases.

Ovary of 2 completely connate carpels, fruit a berry, seeds neither winged nor comose, corolla-lobes overlapping to the left. Spinous shrubs . . . . .

1. CARISSA.

Ovary of 2 carpels, united usually by the style (see *Rauwolfia*).

Calyx not glandular inside, corolla-lobes overlapping to the left.

Fruit indehiscent, of 2 more or less connate 1-seeded drupes, leaves whorled. A shrub . . . . .

2. RAUWOLFIA.

Fruit dehiscent, of 2 slender free follicles.

Leaves opposite, seeds not comose . . . . .

3. LOCHNERA.

Leaves whorled, seeds comose at both ends . . . . .

4. ALSTONIA.

Calyx glandular inside.

Seeds comose at the apex, follicles many-seeded, corolla-lobes overlapping to the right . . . . .

5. HOLARRHENA.

Seeds few, imbedded in pulp, not comose, corolla-lobes overlapping to the left . . . . .

6. ERVATAMIA.

Anthers included or exserted, cohering in a cone round the style and attached to it, cells spurred at the base, ovary of 2 carpels united by the style only or (in *Vallis*) connate in flower, fruit follicular.

Anthers exserted, leaves opposite.

Mouth of corolla without scales, the lobes overlapping to the right . . . . .

7. VALLARIS.

Mouth of corolla with a corona of scales, the lobes overlapping to the left . . . . .

8. WRIGHTIA.

Anthers included, corolla-lobes overlapping to the right.

Leaves whorled, mouth of corolla with a ring of scales . . . . . 9. NERIUM.

Leaves opposite, mouth of corolla without scales.

Flowers  $\frac{1}{2}$  in. long, in lax terminal or pseudo-axillary cymes . . . . . 10. TRACHELOSPERMUM.

Flowers  $\frac{1}{2}$  in. long, in compact 3-chotomous cymes forming elongated leafy panicles . . . . . 11. ICHNOCARPUS.

# 1. CARISSA, Linn.; Fl. Brit. Ind. iii, 630.

Spinous densely branching shrubs, usually erect. *Leaves* opposite, small, coriaceous. *Flowers* nearly sessile, white often tinged with pink, arranged in lax terminal umbel-like or corymbose 3-chotomous cymes. *Calyx* 5-part, rarely glandular within, lobes acute. *Corolla* salver-shaped; tube cylindric, dilated round the anthers, throat without scales, lobes overlapping to the right (in the Indian species). *Stamens* attached to the top of the corolla-tube, included; anthers oblong, acute, the cells with obtuse bases. *Disk* 0. *Ovary* entire, 2-celled; style filiform, stigma fusiform or columnar, minutely 2-fid.; ovules 1-4 in each cell, rarely more. *Berry* ellipsoid or globose. *Seeds* usually 2, peltately attached to the septum, albumen horny or fleshy, cotyledons ovate, radicle inferior.—Species 2, in Trop. Asia, Africa and Australia.

1. *C. Carandas*, Linn. Mantiss. 52; Roxb. Fl. Ind. i, 687; Royle Ill. 270; Brandis For. Fl. 320; F. B. I. iii, 630; Watt E. D.; Kanjilâl For. Fl. Sch. Circ. 232; Gamble Man. Ind. Timb. 479; Collett Fl. Siml. 311. Prain Beng. Pl. 668; Cooke Fl. Bomb. ii, 124.—Vern. Karaunda.

A large erect evergreen shrub or small tree, glabrous except the inflorescence. *Bark* yellowish-brown, scaly. *Branchlets* usually alternate, armed at their base with a pair of stout glabrous spreading spines 1-1½ in. long, the branches generally unarmed. *Leaves* shortly petioled, 1½-3 in. long by 1-2 in. wide, elliptic or obovate, obtuse or shortly mucronate, cuneate at the base, coriaceous dark green and shining above. *Flowers* white or pinkish, faintly scented, arranged in terminal sessile or peduncled pubescent corymbose cymes; pedicels short; bracts linear, pubescent. *Calyx* pubescent, divided more than  $\frac{1}{2}$  way down into lanceolate ciliate segments. *Corolla-tube* about  $\frac{1}{2}$  in. long, dilated upwards; lobes lanceolate, acute, about half as long as the tube, pubescent and ciliate. *Ovary* glabrous, cells 4-ovuled. *Berry* 4- or more-seeded,  $\frac{1}{2}$ -1 in. long, ellipsoid, smooth, purplish when ripe.

Wild in the Baraich and Gonda forests of N. Oudh and in the Gorakhpur district, but cultivated in many places within the area. Flower January-April. **DISTRIB.** Wild or cultivated throughout India and in Ceylon, extending to Burma and Malaya. The wood is suitable for turnery, and the branches make excellent hedges. The half-ripe fruit is eaten as a pickle, and the ripe fruit is also much eaten both raw and as a preserve.

2. *C. spinarum*, Linn. *Mantiss. App.* 559; *F. B. I.* iii, 631; Walt. E. B.; *Kanjilal For. Fl.* 232; *Gamble Man. Ind. Timb.* 480; *Cooke Fl. Bomb.* ii, 125; *Prair. Beng. Pl.* 669. *C. diffusa*, Roxb. *Fl. Ind.* i, 639. *C. hirsuta*, Roth. *C. villosa*, Roxb. *Fl. Ind.* ii (1824), 525. Vern. Karaunda.

A small evergreen shrub, glabrous or with the branches inflorescence and leaves pubescent. Bark light grey, fibrous. Leaves smaller than those of *C. Carandas* and usually acute or mucronate. Flowers scented, white or tinged with pink. *Calyx* divided almost to the base. Berry subglobose,  $\frac{1}{2}$  in. in diam., red changing to dark purple when ripe.

Very common within the area as a forest shrub in dry and rocky situations. Often forming extensive undergrowth in forests of bamboo and *Pinus longifolia* in the Siwalik tracts, and in the teak forests of Bundelkhand and Sangor. Flowers April-June, and the fruit ripens during the cold season. **DISTRIB.** Outer Himalayan ranges up to 6,000 feet from Kashmir to Sikkim, and throughout the drier parts of India and in Ceylon, extending to the S. Andamans and Burma. The branches afford excellent material for dry fences, and the wood is used in turnery. The leaves are eaten greedily by sheep and goats, and the berries, like those of *C. Carandas*, are eaten either raw or as a cooked preserve. *C. hirsuta* is a much more pubescent form, and is not uncommon in the sub-Himalayan tracts of Rohilkhand and N. Oudh.

## 2. *RAUWOLFIA*, Linn.; *Fl. Brit. Ind.* iii, 632.

Small shrubs. Leaves whorled, rarely opposite. Flowers small, in terminal or pseudo-axillary 2-3-chotomous umbel-like or corymbiform cymes. Peduncles alternating with the terminal leaves, finally becoming lateral. *Calyx* 5-nd, or partite, eglandular within, Corolla salver-shaped, tube cylindric, dilated round the anthers, throat usually hairy within; lobes 5, overlapping to the left. Stamens included, attached at or above the middle of the tube; anthers small, acute, free from the stigma, cells rounded at the base. Disk large, cup-shaped or annular, entire or slightly lobed. Carpels 2, distinct or connate, style filiform; stigma capitate, calyptriform at the base, tip 2-fid.; ovules 2, collateral in each carpel. Ripe carpels drupaceous, distinct or connate, usually 1-seeded. Seeds ovoid, albumen fleshy, cotyledons flat, radicle straight or recurved.—Species about 50, in the tropics of both hemispheres and in S. Africa.

*R. serpentina*, Benth. ex Kurz For. Fl. Burma ii, 171; F. B. I. iii, 632; Watt E. D.; Kanjilal For. Fl. 237; Gamble Man. Ind. Timb. 481; Prain Beng. Pl. 671; Cooke Fl. Bomb. ii, 127. *Ophioxylon serpentinum*, Linn.; Roxb. Fl. Ind. i, 694.—Vern. *Chota chánd*.

A small erect glabrous shrub with a pale-coloured bark. *Leaves* whorled, 3-7 in. long by 1-2½ in. wide, lanceolate or oblanceolate, acute or acuminate, tapering gradually into the petiole, thin, pale beneath. *Flowers* white or pinkish, arranged in terminal or lateral corymbose cymes; peduncles stout, 2-5 in. long; pedicels and calyx red; bracts minute, lanceolate. *Calyx-lobes* ¼ in. long, lanceolate. *Corolla* about ½ in. long; tube slender, inflated above the middle; lobes much shorter than the tube, elliptic-oblong, obtuse. *Disk* membranous, slightly lobed. *Drupe*s about ¼ in. in diam., single or didymous and more or less connate, purplish-black when ripe.

Dehra Dun, Siwalik range and in the sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur. Flowers November-December. *DISTRIB.* Westward to Sirhind along the base of the Punjab Himalaya, and eastward to Sikkim, Assam and N. and C. Bengal, and from Bombay through C. and S. India to Ceylon; also in Burma, the Andaman Islands extending to Java. The plant has from very early times been in much repute for its medicinal properties. (See Watt E. D.)

### 3. LOCHNERA, Reichb. Conspectus 134.

VINCA IN FL. BRIT. IND. III, 640.

Annual or perennial herbs or undershrubs. *Leaves* opposite axillary glands numerous, in a fringe; outer long and filiform, inner minute. *Flowers* axillary, solitary or in pairs, white or pink. *Calyx* herbaceous, 5-partite; segments subulate, scarcely imbricate. *Corolla* salver-shaped; tube slender, cylindric, somewhat inflated round the stamens below the constricted mouth, lobes overlapping to the left. *Stamens* on the corolla-tube; filaments very short; anthers free from the stigma, ovate-lanceolate, acute, shortly and obtusely 2-lobed at the base. *Disk* replaced by 2 long linear glands alternating with the carpels. *Carpels* 2, free, style filiform, stigma depressed-capitate, with a long hyaline reflexed frill at the base and a minute obtuse 2-lobed apiculus surrounded by a very short erect membranous rim. *Follicles* cylindric, slightly spreading. *Seeds* many, small, testa rugose, -albumen fleshy; cotyledons oblong, flat.—Species 3, in Trop. America, India and Madagascar.

*L. pusilla*, K. Schum. in Engl. and Prantl. Pflanzenf. iv, part 2, 145; Cooke Fl. Bomb. ii, 129. *Vinea pusilla*, Murr.; F. B. I. iii, 640; Watt E. D. V. parviflora, Retz.; Roxb. Fl. Ind. ii, 1; Royle Ill. 270.

An erect much-branched pale-green glabrous annual, 6-24 in. high. Stem and branches acutely 4-angled. Leaves membranous,  $1\frac{1}{2}$ -3 in. long, lanceolate, acuminate, tapering to the base, margins minutely scabrid, petiole  $\frac{1}{2}$  in. or less. Flowers small, solitary or in pairs, pedicels very short. Calyx  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, lobes filiform. Corolla-tube  $\frac{1}{2}$  in.; mouth narrow, hairy, throat glabrous inside; lobes  $\frac{1}{2}$  in. long, oblong-obovate, apiculate. Follicles  $1\frac{1}{2}$ -2 in. long, slender, straight, striate, glabrous. Seeds  $\frac{1}{10}$  in. long, cylindric, rounded at the ends, muricately ribbed, black when ripe.

A common weed in many parts of the area. DISTRIB. W. Himalaya up to 2,000 feet, also in W., Cent. and S. India extending to Ceylon.

#### 4. ALSTONIA, R. Br.; Fl. Brit. Ind. iii, 641.

Trees or erect shrubs. Leaves usually whorled. Flowers in subterminal corymbose cymes. Calyx short, 5-lobed or-partite. Corolla salver-shaped, tube cylindric; throat naked, closed by a ring of reflexed hairs; lobes overlapping to the right or left. Stamens included, attached near the top of the tube; anthers free from the stigma, subacute. Disk annular or 0, lobed. Carpels 2, distinct; style filiform, top ovoid or oblong, stigma minute or 2-toothed, ovules numerous. Follicles 2, linear, slender. Seeds oblong or linear, flattened, peltately attached, often ciliate, albumen scanty; cotyledons oblong, flat, radicle superior.—Species about 30, in Tropical Asia, Australia and Polynesia.

*A. scholaris*, R. Br. in Mem. Wern. Soc. i, 75; Royle Ill. 270; Brand. For. Fl. 325; F. B. I. iii, 642; Watt E. D.; Kanjilal For. Fl. 233; Gamble Man. Ind. Timb.; Prain Beng. Pl. 672; Cooke Fl. Bomb. ii, 132.—Vern Sâtian.

A large evergreen tree with milky juice, up to 60 feet or more in height, with dark-grey bark. Stem fluted and usually buttressed towards the base; branches whorled, the smaller ones densely lenticellate. Leaves in verticils of 4-7, coriaceous, bright-green and shining above, pale or glaucous beneath, 3-8 in. long, oblong-lanceolate or obovate, obtuse or shortly and bluntly acuminate, tapering at the base into a short petiole; main lateral nerves many, parallel and almost at right angles to the stout midrib, uniting close to the edge into an intramarginal vein. Flowers greenish-white, arranged in compact umbellately branched pubescent cymes; main peduncles stout, 2-3 in. long; secondary ones slender, often supported by a leaf-like spatulate bract; pedicels short, bracteoles oblong or ovate. Calyx  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, pubescent:

lobes  $\frac{7}{8}$  in., oblong, ciliate. *Corolla-tube*  $\frac{1}{2}$  in. long, constricted in the middle, hairy on both sides; lobes ovate, obtuse. *Disk* 0. *Anthers* acute. *Ovary* villous, stigma bifid. *Follicles* terete, 1-2 feet long and about  $\frac{1}{8}$  in. in diam., pendulous in clusters. *Seeds* about  $\frac{1}{2}$  in. long, slender, flattened, with a long tuft of tawny hairs at each end.

In the eastern portion of Debra Dun and eastwards in the moist forests along the base of the Himalaya, but nowhere abundant. It flowers December-March and the fruit ripens during May and June. *DISTRIB.* E. Bengal, Assam, W. and S. India, Burma, Malay Pen. and Archipelago, extending also to Queensland and Trop. Africa. The wood is light and easily worked and is much used for boxes, etc., and in Burma for making black boards, hence the specific name.

##### 5. HOLARRHENA, R. Br.; Fl. Brit. Ind. iii, 644.

Trees or shrubs. *Leaves* opposite, membranous. *Flowers* white, in terminal subaxillary corymbose cymes. *Calyx* 5-lobed or partite, usually glandular within; lobes small, narrow. *Corolla* salver-shaped; tube slender, cylindric; lobes oblong, overlapping to the left. *Stamens* near the base of the tube; anthers included, oblong-lanceolate, mucronate, free from the style. *Disk* 0. *Carpels* 2, distinct; style short, filiform, stigma oblong-fusiform, apex entire or with two teeth; ovules many in each carpel. *Follicles* elongate, spreading and incurved, terete. *Seeds* linear or oblong, compressed, concave, tipped with a deciduous coma, albumen scanty; cotyledons broad, complicate; radicle short, superior.—Species 7 or 8, in Trop. Asia and Africa.

*H. antidysenterica*, Wall. Cat. 1672; Brandis For. Fl. 326, t. 40; F. B. I. iii 644; Watt E. D.; Cooke Fl. Bomb. ii, 133; Kanjilal For. Fl. 234; Gamble Man. Ind. Timb. 484; Collett Fl. Stml. 311; Prain Beng. Pl. 674. *H. pubescens*, Wall.; Royle Ill. 270.—Vern. Karra, kura, dudhi, indarjau.

A small deciduous tree, with brown bark exfoliating in irregular flakes. *Leaves* sessile or nearly so, rather thin, glabrous or more or less tomentose especially beneath, 3-6 in. long, broadly ovate or elliptic, rounded or tapering at the base; main lateral nerves arcuate, conspicuous, connected by prominent transverse veins. *Flowers* white, inodorous, arranged in terminal sessile corymbose cymes, pedicels slender; bracts small, deciduous. *Calyx-lobes*  $\frac{1}{5}$ - $\frac{1}{4}$  in. long, lanceolate, acuminate, ciliate. *Corolla* about 1 in. in diam., creamy white, puberulous outside; tube  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, throat without a ring of hairs; lobes about as long as the tube, oblong, obtuse. *Follicles* slender, 8-15 in. long,  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., usually marked with many narrow white specks. *Seeds* linear, about  $\frac{1}{2}$  in. long; coma brown, about twice as long as the seed.



Abundant in Dehra Dun, on the Siwalik range and throughout the sub-Himalayan tract eastwards to Gorakhpur, also in Bundelkhand. Flowers in May and June, and the fruit ripens during the cold season. **DISTRIB.** Throughout India and in Burma, ascending to 4,000 feet on the Western Himalaya. Sir Dietrich Brandis remarks that in Peninsula specimens the style is much longer than in those of Northern India, and the anthers are attached to the middle of the corolla-tube instead of at the base. Gamble draws attention to its sylvicultural importance as an associate of *sāl* in Northern and Central India, and to its value in the reclamation of waste lands. The soft white wood is largely used, especially at Saharanpur, for carving and in turnery, and many of the beads worn round the neck as a charm are made from this wood. The bark is used for dysentery, and the leaves and seeds are also employed medicinally.

### 6. ERVATAMIA, Stapf.

TABERNÆMONTANA IN FL. BRIT. IND. III, 645.

Shrubs rarely small trees, usually glabrous. *Leaves* opposite; axillary stipules usually distinct, axillary glands small. *Flowers* often showy, usually in pairs and arranged in terminal or pseudo-axillary corymbose or umbelliform cymes. *Calyx* small; lobes 5, free or connate at the base, glandular inside, imbricate. *Corolla* salver-shaped; tube cylindric, slightly widened towards the naked mouth; lobes overlapping usually to the left. *Stamens* included; filaments short; anthers linear, acute, 2-lobed at the base. *Disk* 0. *Ovary* of 2 carpels which sometimes slightly cohere; style usually long and slender; stigma on a level with the anthers, clavate or oblong-ellipsoid, with a slender papillose bifid apiculus; ovules numerous, in many series. *Follicles* 2, more or less coriaceous when mature, obliquely ovate to lanceolate, usually curved and beaked. *Seeds* usually few, embedded in an orange-coloured or red aril, ellipsoid, deeply grooved ventrally, albumen copious.—Species about 30, in Trop. Asia, Australia and Polynesia, and one in Madagascar.

*E. coronaria*, Stapf. in *Fl. Trop. Afr.* iv, 127; Cooke *Fl. Bomb.* ii, 134. *Tabernæmontana coronaria*, Willd. *Enum. Hort. Berol.* 275; Roxb. *Fl. Ind.* ii, 23; Royle *Ill.* 270; Brandis *For. Fl.* 322; *F. B. I.* iii, 646; Watt *E.D.*; Kanjilál *For. Fl.* 233; Gamble *Man. Ind. Timb.* 485; Prain *Beng. Pl.* 673.—Vern. *Chándni*.

An evergreen glabrous' dichotomously branched shrub with silvery-grey bark. *Leaves* 3-6 in. long, elliptic-lanceolate or oblanceolate, acuminate or caudate, tapering at the base into a short petiole, dark green and shining above, pale beneath, membranous or thinly coriaceous, main

lateral nerves 6-9 pairs; petioles  $\frac{1}{2}$ -amplexicaul at the base. *Cymes* few-flowered; peduncles about  $1\frac{1}{2}$  in. long, pedicels slender. *Flowers* pure white, fragrant at night, buds clavate. *Calyx*-lobes broadly ovate, acute or rounded. *Corolla*-tube  $\frac{3}{4}$ -1 in. long, dilated round the anthers, lobes about as long as the tube, obliquely ovate, obtuse, crisped on one margin. *Anthers* acuminate. *Carpels* glabrous. *Follicles* 1-2 in. long, spreading, recurved at the acuminate apex, 1-3-keeled, opening out flat when ripe. *Seeds* 3-6, oblong, striated, embedded in a red pulpy aril.

Sub-Himalayan tract from Dehra Dun eastwards. *Flowers* May-August, fruiting during the cold season. *DISTRIB.* Garhwal, E. Bengal, Khasia Hills, Assam and Burma, also found in Trinidad. An ornamental shrub, much cultivated in gardens. The flowers are dimorphic as regards the length of the style and the position of the anthers. Under cultivation the flowers often become double.

## 7. VALLARIS, Burm.; Fl. Brit. Ind. iii, 650.

Twining shrubs. *Leaves* opposite, minutely dotted. *Flowers* white in axillary or pseudo-axillary cymes or fascicles. *Calyx* 5-partite-glandular or not within, segments narrow. *Corolla* salver-shape or subrotate, tube short, throat naked; lobes broad, contorted, overlapping to the right. *Stamens* attached at the top of the corolla-tube; filaments very short, clavate; anthers exerted, conniving in a cone and adherent to the stigma, connective with a dorsal gland, cells produced into rigid basal spurs. *Disk* annular or cupular, with 5 lobes or scales. *Carpels* 2, at first connate, many-ovuled; style filiform, pubescent; stigma thick, obscurely annulate near the base. *Fruit* oblong, acuminate, the carpels at length separating. *Seeds* 2-seriate, ovate, acuminate, compressed, tip comose, albumen scanty.—Species 5 or 6, in Trop. Asia and Malaya.

*V. Heynei*, Spreng. Syst. i, 635; *F. B. I.* iii, 165; *Watt E. D.*; *Cooke Fl. Bomb. ii*, 136; *Gamble Man. Ind. Timb.* 486; *Collett Fl. Siml.* 311, *Kanjilâl For.* Fl. 234; *Prain Beng. Pl.* 675. *V. dichotoma*, Wall.; *Royle Ill.* 270; *Brandis For.* Fl. 327. *Echites dichotoma*, Roxb. *Fl. Ind. ii*, 19.—*Vern. Dudhi bel.*

A large twining shrub with ash-coloured bark. *Leaves* usually glabrous, gland-dotted,  $2-4\frac{1}{2}$  in. long, elliptic or oblong-lanceolate, acuminate, base acute, upper surface shining; petiole  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, with glands in the axils. *Flowers*  $\frac{3}{4}$  in. across, in lax pubescent cymes, creamy white, fragrant; peduncles slender, pubescent or glabrous; pedicels usually decurved, pubescent; bracts linear-lanceolate, acute, pubescent. *Calyx* pubescent; lobes  $\frac{1}{10}$  in. long, ovate-lanceolate, obtuse or subacute, ciliate. *Corolla*  $\frac{3}{4}$  in. across, minutely pubescent outside, tube  $\frac{1}{2}$

in. long, limb spreading; lobes obovate, obtuse. Ovary hairy, stigma pointed. Fruit 4-6 in. long, acuminate from a rounded base, valves thick and fibrous. Seeds about  $\frac{1}{4}$  in. long, ovoid, beaked; coma  $\frac{3}{4}$  in. long, silvery white.

Abundant within the area, especially in the sub-Himalayan forests eastwards from Dehra Dun, and in Bundelkhand. Flowers December-April, and the fruit ripens from January-April of the following year. DISTRIBUTION: Punjab westwards to the Sutlej, Himalaya up to 5,000 feet in Kumaon, E. Bengal and southwards to Ceylon, also in Burma. The twigs are used for making baskets in the Saharanpur district. The plant is cultivated in gardens for its scented flowers.

### 8. WRIGHTIA, R. Br.; Fl. Brit. Ind. iii, 652.

Shrubs or small trees, often with slender cord-like branches. Leaves opposite. Flowers red white or yellow, in terminal or pseudo-axillary cymes. Calyx short, 5-partite, with glands or scales inside. Corolla salver-shaped; tube cylindric, usually short, with a corona of 5-10 usually fimbriate scales in the throat, lobes overlapping to the left. Stamens at the top of the corolla-tube; filaments short, dilated; anthers exserted, sagittate, conniving around and adhering to the stigma, cells spurred at the base. Disk none. Carpels 2, free or connate, many-ovuled, style filiform. Follicles distinct or at first connate. Seeds linear, compressed, narrowed at the apex and with a deciduous coma at the base; albumen scanty or none; cotyledons broad, convolute. Species about 10, in Trop. Asia and Australia, one extending to S. Africa.

Leaves glabrous or puberulous beneath; follicles smooth, cohering at the apex only . . . . .	1. <i>W. tinctoria</i> .
Leaves tomentose on both surfaces; follicles connate throughout, rough with white tubercles . . . . .	2. <i>W. tomentosa</i> .

1. *W. tinctoria*, R. Br. in Mem. Wern. Soc. i, 74; Royle Ill. 270; Brandis For Fl. 324; F. B. I. iii, 653; Watt E. D.; Gamble Man. Ind. Timb. 486; Cooke Fl. Bomb. ii, 137. *W. Rothii*, G. Don. *Nerium tinctorium*, Roxb.; Fl. Ind. ii, 4.—Vern. Dudhi (Bundelkhand), Khirni (Rajputana).

A small deciduous tree, glabrous or more or less pubescent. Leaves 3-5 in. long, elliptic-ovate or lanceolate or obovate-oblong, caudate or acuminate, base rounded or acute; main lateral nerves 6-12 pairs, conspicuous in the mature leaf, petiole very short. Flowers  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., white, fragrant, arranged in lax terminal dichotomous cymes; branches slender, spreading; bracts minute, ovate. Calyx-lobes ovate, rounded, margins membranous. Corolla tube  $\frac{1}{2}$  in. long; lobes  $\frac{1}{2}$  in., linear-

oblong, obtuse; scales linear, scattered. *Anthers* white, exserted. *Follicles* pendulous, 10-20 in. long, slender, cylindric, glabrous, cohering at their tips only. *Seeds*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, linear, glabrous except for the basal coma.

Bundelkhand and Rajputana in deciduous forests, also in the forests of N. Ondh. Flowers March-May. **DISTRIB.** Central W. and S. India, also in Ceylon and Burma. The white even-grained wood is much used for carving and turnery. The leaves yield an indigo-like dye which is used by the natives of S. India, and the seeds (*mitha indarjau*) are eaten. In *C. Rothii* the branchlets and leaves are distinctly pubescent. This form occurs in Bundelkhand and southwards.

**2. W. tomentosa**, R. & S. *Syst. iv*, 414; Brandis *For. Fl.* 323; F. B. I. iii, 653; Watt *E. D.*; Kanjilal *For. Fl.* 235; Gamble *Man. Ind. Timb.* 487; Prain *Beng. Pl.* 674; Cooke *Fl. Bomb. ii*, 137. *W. mollissima*, Wall.; Royle *Ill.* 270. *Nerium tomentosum*, Roxb. *Fl. Ind. ii*, 6.—Vern. *Dudh, indarjau*.

A small deciduous tree with grey corky bark; young parts densely tomentose. *Leaves* tomentose on both surfaces, 3-6 in. long, elliptic-oblong, caudate-acuminate, reddish-brown when dry, base acute, main lateral nerves 8-14 pairs, petiole  $\frac{1}{4}$  in. long. *Flowers* about 1 in. across, rather foetid, arranged in short dense erect terminal corymbose cymes. *Calyx* pubescent outside, glandular within; lobes  $\frac{1}{2}$  in. long, ovate, obtuse. *Corolla* white or tinged with pink, turning to pale yellow, tube twice as long as the calyx-lobes. *Corona* of orange-coloured fleshy scales. *Follicles* 8-12 in. long, subcylindrical, laterally compressed, connate throughout, grooved on each side at the junction of the carpels, rough with many white prominences. *Seeds*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, slender, tapering towards the apex and with a deciduous white coma at the lower end.

Sub-Himalayan tract from Dehra Dun eastwards to Gorakhpur, also in Merwara and Bundelkhand. Flowers during May and June. **DISTRIB.** Throughout the hotter parts of India in deciduous forests, on the Himalaya up to 4,000 ft. westwards to the Beas and eastwards to Sikkim, also in Ceylon and Burma. The white close-grained wood is suitable for carving and turning, and is largely used, like that of *Holarrhena*, for the manufacture of carved plates and picture-frames in the Saharanpur district. The bark of the stem and roots is regarded as an antidote to snake-bite and the sting of scorpions.

## 9. NERIUM, Linn.; Fl. Brit. Ind. iii, 654.

Erect glabrous shrubs. *Leaves* usually in whorls of three, narrow, coriaceous; nerves slender, very close. *Flowers* large, in terminal racemose cymes. *Calyx* 5-partite, glandular within, segments narrow. *Corolla* funnel-shaped; tube cylindric, expanding above, with five fringed scales on the throat, lobes overlapping to the right. *Stamens*

inserted near the mouth of the tube, filaments short; anthers conniving around and adhering to the stigma, tipped with long hairy appendages, each cell produced downwards into a rigid spur-like appendage. *Carpels* 2, distinct, many ovuled; style filiform or dilated upwards; stigma with a reflected lobed membrane surmounted by 5 tubercles, tip subglobose. *Follicles* cylindric, straight, adpressed. *Seeds* oblong, villous; coma terminal, caducous; albumen fleshy, cotyledons flat.—Species 2 or 3, extending from the Mediterranean to N. Asia and Japan.

*Nerium odorum*, Soland. in *Hort. Kew.* ed. I, i, 297; Roxb. *Fl. Ind.* ii, 2; Brandis *For. Fl.* 323; F. B. I. iii, 655; Watt *E. D.*; Kanjilal *For. Fl.* 236; Gamble *Man. Ind. Timb.* 437; Collett *Fl. Siml.* 312; Prain *Beng. Pl.* 676; Cooke *Fl. Bomb.* ii, 143.—Vern. Kaner.

A large glabrous evergreen shrub with milky juice. *Leaves* in threes, shortly stalked, coriaceous, 4-6 in. long, linear-lanceolate, acuminate, tapering into the short petiole, dark green and shining above, midrib stout; nerves numerous, spreading horizontally. *Flowers* red rose-coloured or white, fragrant. *Calyx*-lobes lanceolate. *Corolla*  $1\frac{1}{2}$  in. in diam., fragrant, lobes rounded. *Filaments* hairy, appendages of anthers twice as long as the cells. *Follicles* 6-9 in. long, rigid, at length separating. *Seeds* about  $\frac{1}{2}$  in. long, tipped with a coma of light brown hairs.

On the edges of rocky water-courses on both sides of the Siwalik Range in the districts of Dehra Dun and Saharanpur, also in N. Oudh. Flowers usually April to June. *DISTRIB.* Himalaya from Nepal westwards to Kashmir up to 6,500 ft., on the Punjab Salt Range, extending westwards to Baluchistan and Afghanistan, also in C. and S. India. It is extensively cultivated throughout the greater part of India, as well as in China and Japan. The leaves are used in native medicine, and the bark and root are poisonous. This shrub is closely allied to the European oleander, which is found as far east as Persia.

#### 10. TRACHELOSPERMUM, Lemaire; Fl. Brit. Ind. iii, 667.

Climbing shrubs. *Leaves* opposite, nerves distant. *Flowers* white or purplish, in lax terminal or pseudo-axillary cymes. *Calyx* small, 5-partite, glandular or scaly within. *Corolla* salver-shaped; tube cylindric, dilated round the anthers; lobes 5, oblique, overlapping to the right, twisted to the left. *Stamens* attached above the middle of the tube; filaments short, broad; anthers conniving over and adhering to the stigma, cells spurred at the base. *Disk* annular or of oblong glands. *Carpels* 2, distinct, many-ovuled; style cupular, stigma oblong. *Follicles* elongate, slender, incurved, terete. *Seeds*

linear, crowned with a tuft of long hairs, albumen copious; cotyledons linear, flat.—Species 8, E. Asiatic and Malayan.

*T. fragrans*, Hook. f. in *F. B. I.* iii, 667; Watt *E. D.*; Gamble *Man. Ind. Timb.* 489; Kanjilal *For. Fl.* 237; Collett *Fl. Siml.* 313. *Ichnocarpus fragrans*, Wall.; Royle *Ill.* 270; Brandis *For. Fl.* 327.

A tall nearly glabrous scandent shrub; old stems with tubercled bark, branches pendulous. Leaves 3-5 in. long, ovate or elliptic-lanceolate, bluntly acuminate, thinly coriaceous, shining above, petiole  $\frac{1}{2}$  in. long. Peduncles and pedicels slender; bracts minute, lanceolate. Flowers white or pink, fragrant. Calyx-lobes ovate, acute, with ciliate edges,  $\frac{1}{2}$  the length of the corolla-tube. Corolla-tube  $\frac{1}{2}$  in. long, pubescent at the base of the lobes and round the mouth. Disk of 5, small erect glands. Follicles 4-9 in. long or more. Seeds  $\frac{1}{2}$  in. long, obtuse at both ends, smooth.

Dehra Dun, in the Mothronwala swamp and on the banks of the Ré-nadi. Flowers April-June. DISTRIB. Sub-tropical and temperate Himalaya up to 7,000 ft. from Simla to Sikkim and Bhutan, also in Assam and Upper Burma.

## 11. ICHNOCARPUS, R. Br.; Fl. Brit. Ind. iii, 669.

Climbing shrubs. Leaves opposite, nerves distant. Flowers small or minute, in long terminal and axillary paniculate cymes. Calyx 5-fid., glandular within. Corolla salver shaped, throat contracted or villous; lobes narrowed to an obtuse point, overlapping to the right, the upper half of each lobe reflexed in bud. Stamens at or below the middle of the corolla-tube; anthers sagittate, conniving over and adhering to the stigma, cells spurred at the base. Disk free, 5-lobed. Carpels 2, distinct, exserted from the disk, many-ovuled, hairy, style short, stigma ovoid or oblong. Follicles slender, spreading or divaricate. Seeds narrowed at the tip, crowned with a deciduous coma, albumen scanty, cotyledons long and flat.—Species 5 or 6, in India, Malaya and Australia.

*I. frutescens*, R. Br. in *Mem. Wern. Soc.* i (1809), 62; Ait. *Hort. Kew.* ed. 2, ii, 69; Royle *Ill.* 270; Brandis *For. Fl.* 327; *F. B. I.* iii, 669; Watt *E. D.*; Kanjilal *For. Fl.* 236; Gamble *Man. Ind. Timb.* 489; Cooke *Fl. Bomb.* ii, 142; Prain *Beng. Fl.* 680.—Vern. *Káli dudhi*, *belkamu* (Saharanpur), *bamar* (Gorakhpur).

An evergreen climbing shrub; young branches inflorescence and under surface of leaves rusty-tomentose. Leaves variable, 2-3 in. long, elliptic-oblong or ovate-lanceolate, acute or acuminate, usually rounded at the base, dark-green glabrous and shining above, pale and more or less pubescent beneath, with slender reticulations between the main lateral

nerves; petiole  $\frac{1}{2}$ - $\frac{1}{3}$  in. long. *Flowers* greenish-white, more or less fragrant. *Calyx* pubescent; lobes ovate, acute, minutely glandular inside. *Corolla*  $\frac{1}{2}$ - $\frac{1}{4}$  in. across, twice as long as the calyx; tube  $\frac{1}{2}$  in. long, swollen round the included anthers, throat villous; lobes  $\frac{1}{2}$  in. long, hairy on upper surface, narrowed into a slender twisted acuminate point. *Disk-lobes* longer than the hairy ovary. *Follicles* 3-6 in. long, straight or somewhat curved, pubescent when young. *Seeds*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, slender, coma as long as the seed.

Abundant within the area in forests and hedgerows. *Flowers* Aug.-Dec. *DISTRIB.* Throughout the greater part of India, also in Ceylon and Burma, ascending to 4,000 ft. on the Himalaya; found also in China, Java and Australia. The roots and leaves are used medicinally, and the twigs are collected for making baskets in the Saharanpur district.

*Thevetia neriifolia*, Juss. (Yellow Oleander), a native of Trop. America, is cultivated in gardens over the greater part of India. It is an evergreen glabrous shrub or small tree with leaves resembling those of the oleander, and the flowers are bright yellow. The milky juice is extremely poisonous.

*Plumeria acutifolia*, Poir. Vern. Gul-áchin. This is another introduction, probably indigenous in Mexico. It is a small soft-wooded tree with thick fleshy branches. The fragrant flowers, which open before the leaves have developed, are white with a yellow centre and pinkish outside. It is often met with in gardens and in the vicinity of temples. The bark and milky juice are used in native medicine.

## LXXII.—ASCLEPIADACEÆ.

Herbs or shrubs, generally with milky and acrid juice. Stems simple or branched, usually twining. *Leaves* mostly opposite, sometimes wanting, simple, entire, exstipulate. *Flowers* usually small, regular, 2-sexual, 5-merous, often arranged in umbelliform cymes. *Calyx* inferior, divided nearly or completely to the base; segments imbricate, usually with minute processes at their bases within. *Corolla* variously shaped, hypogynous, gamopetalous, regular, 5-lobed; tube within or at its mouth often furnished with a ring of variously shaped scales or processes (the coralline corona). *Stamens* 5, inserted usually at or near the base of the corolla and alternate with its lobes; filaments flat, usually connate in a fleshy tube round the ovary (staminal column), the apex of the tube often united to the dilated part of the style, and with usually fleshy scales or processes on the back (staminal corona); anthers not connate with each other, free or united to the style, 2-celled, margins of anthers or their basal processes more or less horny or wing-like,

usually projecting outwards, the adjacent wings of each pair of anthers nearly meeting and forming between them narrow fissures leading to the stigmatic cavities; connectives of the anthers often produced into terminal membranous and sometimes connate appendages. *Pollen* forming 1 or 2 granular or waxy masses in each cell, the pollinia of the adjoining cells of two contiguous anthers united in pairs or fours either directly or by appendages (caudicles) to glands (corpuscles) which lie on the dilated portion of the style. *Ovary* of two distinct superior carpels, inclosed within the staminal column; styles 2, short, united above into a 5-angled disk (style apex included between the anthers or produced beyond them into a long or short simple or 2-fid column; ovules many, rarely few, imbricate in several series on the projecting placenta. *Seeds* compressed, usually flat and often margined, crowned with a long dense brush of hairs (*coma*), albumen thin or 0.—Species exceeding 1,800, widely spread throughout the tropical and subtropical regions of the world, a few in temperate regions.

Filaments free or slightly connate at the base,

pollen-masses granular.

Corolla-lobes valvate . . . . . 1. HEMIDESMUS.

Corolla-lobes overlapping to the right.

Corolla-lobes free, fleshy, not aristate . . . 2. CRYPTOLEPIS.

Corolla-lobes connate in a ring, aristate . . 3. PERIPLOCA.

Filaments combined into a tube, pollen-masses waxy.

Anthers with a membranous appendage.

Pollen-masses pendulous.

Stems erect

Corolla-lobes valvate, corona-pro-  
cesses laterally compressed; fol-  
licles short, turgid. Flowers large . . 4. CALOTROPIS.

Corolla-lobes overlapping to the right,  
corona-processes short and fleshy.

Flowers medium-sized. . . . . 5. PENTANTHRA.

Stems twining.

Corona staminal, single.

Corolla subrotate, reddish-purple  
inside, corona a fleshy truncate  
ring. Flowers large, fragrant. . . 6. HOLOSTEMMA.

Corolla divided  $\frac{1}{2}$  way down, white  
or pink with purple veins, corona  
5-lobed. Flowers large . . . 7. OXYSTEMMA.

Corolla lobed nearly to the base,  
corona of 5 scales. Flowers small,  
greenish . . . . . 8. PENTATROPIS.



- Corona staminal, double; follicles covered with soft spines . . . 9. *DENIA*.
- Pollen-masses erect.
- Corona adnate to the corolla-tube . . . 10. *GYMNEMA*.
- Corona staminal.
- Corona-lobes adnate to the base of the anthers or none . . . 11. *GONGRONEMA*.
- Corona-lobes adnate to the staminal column, without a subulate process on the inner face of the free apical portion . . . 12. *MARSDENIA*.
- Corona-lobes adnate to the staminal column, each with a subulate process on the inner face of the free apical portion . . . 13. *PERGULARIA*.
- Corona of 5 small tubercles adnate to the staminal column . . . 14. *TYLOPHORA*.
- Anthers incumbent on the stigma, without a membranous appendage. Corolla-lobes valvate, pollen-masses erect.
- Corolla-tube short, limb rotate or saucer-shaped.
- Corona of 5 small erect hair-tipped scales inserted in the sinuses of the corolla-lobes, sometimes with an inconspicuous fleshy ring at the base of the staminal column . . . 15. *LEPTADENIA*.
- Corona double, entirely staminal. Flowers 1-4 at the nodes, or many in a terminal umbel . . . 16. *BRACHYSTELMA*.
- Corolla-tube more or less elongate and often inflated at the base.
- Corona of 5 small erect scales inserted in the sinuses of the corolla-lobes, sometimes with an inconspicuous fleshy ring at the base of the staminal column . . . 17. *ORTHANTHERA*.
- Corona double, staminal, attached to the column . . . 18. *CEROPEGIA*.

### 1. *HEMIDESMUS*, R. Br.; Fl. Brit. Ind. iv, 4.

A twining shrub. *Leaves* opposite, hoary or pubescent beneath. *Flowers* small, in opposite crowded subsessile axillary cymes greenish-purple. *Calyx* 5-partite; lobes glandular within at the base, acuminate. *Corolla* rotate; lobes thick, valvate. *Coronal scales* 5, on the throat of the corolla and alternate with its lobes, short, fleshy. *Stamens* attached to the base of the corolla-tube, filaments distinct or slightly connate at the base, anthers with

inflexed membranous tips, pollen-masses cohering in pairs in each cell, granular, appendages of the corpuscles dilated or hooded. *Stigma* 5-angled, with a flat crown. *Follicles* divaricate, slender, terete, smooth. *Seeds* comose. A single species, restricted to India.

*H. indicus*, R. Br. in Mem. Wern. Soc. i. 57; F. B. I. iv, 5; Royle III. 274; Watt E. D.; Prain Beng. Pl. 696; Cooke Fl. Bomb. ii, 146 *Asclepias pseudosarsa*, Roxb.; Fl. Ind., ii, 39 (excl. syn.).

A twining or prostrate shrub. *Leaves* 2-4 in. long, elliptic-oblong to linear-lanceolate, obtuse or acute, apiculate, usually glabrous, dark-green or mottled with white above, pale or silvery white and sometimes pubescent beneath, midrib stout, veins reticulate, petiole  $\frac{1}{2}$  in. long. *Pedicels* short, clothed with many ovate acute imbricating bracts. *Calyx*  $\frac{1}{10}$  in. long, glabrous outside; lobes ovate, acute, margins ciliate. *Corolla*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, greenish outside, purple within; tube very short; lobes fleshy, ovate-oblong, acuminate, valvate. *Follicles* 4-6 in. long. *Seeds*  $\frac{1}{4}$ - $\frac{1}{2}$  in., flattened, black; coma 1 in. long, pure white.

Forests of N. Oudh and Gorakhpur, also in Bundelkhand. Flowers during the greater part of the year. **DISTRIB.** Eastwards to Bengal and the Sundribans, and from the Central Provinces to S. India and Ceylon. In S. India the root of this plant is used as a substitute for sarsaparilla; and in many parts of India it is prescribed by native doctors, either alone or in conjunction with other drugs, in the treatment of various ailments.

## 2. CRYPTOLEPIS, R. Br., Fl. Brit. Ind. iv, 5.

Glabrous and usually twining shrubs. *Leaves* opposite. *Flowers* small and in lax slender dichotomous few-flowered terminal or axillary cymes. *Calyx* deeply 5-fid., with five scales within. *Corolla-tube* short, cylindric or bell-shaped; lobes linear, overlapping and twisted to the right in bud. *Corona-scales* free, adnate to the middle of the corolla-tube, linear or clavate, conniving. *Stamens* attached towards the base of the corolla-tube, filaments subconnate by their broad bases; anthers short, adhering to the stigma by their bases; tips acuminate, conniving; pollen-masses cohering in pairs in each cell, granular appendages of corpuscles oblong. *Stigma* broadly conic. *Follicles* 2, divaricate, terete, smooth. *Seeds* comose.—Species about 20, in tropical Asia and Africa.

*C. Buchananii*, R. and S. Syst. iv, 409; Falc. in Trans. Linn. Soc. xiv, 53, t. 5; Brandis For. Pl. 330; F. B. I. iv, 5; Watt E. D.; Kanjilal For. Pl. 239; Gamble Man. Ind. Timb. 490; Collett Fl. Siml. 315; Prain Beng. Pl. 685; Cooke Fl. Bomb. ii, 147; *C. reticulata*, Wall.; Royle III. 270. *Nerium reticulatum*, Roxb.; Fl. Ind. ii, 8.—Vern. Karanta, medka-singhi (Dehra Dun).

A large glabrous twining shrub; branches terete, whitish. *Leaves* coriaceous, shortly stalked, 3-6 by 1-2½ in., oblong-ovate or elliptic, with a rounded or retuse and apiculate apex, usually acute at the base, dark-green above, glaucous beneath; main lateral nerves many, slender, horizontal and uniting within the margin; petioles ¼-½ in. long. *Flowers* pale greenish-yellow, in short axillary panicle cymes; bracts ovate-lanceolate, with scarious margins. *Calyx*-lobes ovate, acute. *Corolla*-lobes ¼ in. long, linear or linear-lanceolate. *Corona* of 5 clavate scales. *Follicles* 2-4 in. long, stout, straight, terete, tapering. *Seeds* ½ in. long, ovate-oblong, compressed, black, coma 1½ in. long.

Common within the area, especially in the deciduous forests of the sub-Himalayan tracts and in Bundelkhand, also found in hedges. *Flowers* May-June. *DISTRIB.* Throughout the hotter parts of India, ascending to 4,000 ft. on the Himalaya; also in Ceylon, Burma and China. A useful fibre is said to be yielded by this plant.

### 3. PERIPLOCA, Linn.; Fl. Brit. Ind. iv, 11.

Erect or twining glabrous shrubs, sometimes leafless. *Leaves* opposite. *Flowers* in lax terminal or axillary cymes, greenish externally, purplish within. *Calyx* 5-partite, with five glands within. *Corolla* rotate; lobes obtuse, usually bearded within, overlapping to the right. *Coronal scales* connate into a 10-lobed ring, often produced behind the stamens into five subulate or branched processes. *Stamens* within the corona; filaments free, broad and flat; anthers bearded on the back, conniving over and adhering to the stigma, tips cohering and with incurved appendages; pollen-masses in pairs in each cell, granular; appendages of the corpuscles dilated. *Stigma* convex. *Follicles* conniving or divaricate, cylindric, smooth. *Seeds* comose.—Species about 12, in S. Europe, W. Asia and tropical Africa.

Leaves small, ovate, usually absent; follicles  
divaricate . . . . .

1. *P. aphylla*.

Leaves lanceolate, acuminate; follicles not  
divaricate . . . . .

2. *P. calophylla*.

1. *P. aphylla*, Dene, in Jacquem. Voy. 190, t. 116; Brandis For. Fl. 330; Ind. Trees 467; F. B. I. iv, 12; Watt E. D.; Gamble Man. Ind. Timb. 490; Cooke Fl. Bomb. ii, 143. *Campelepis viminea*, Falc. in Trans. Linn. Soc. xix, 109.

An erect branching shrub with milky juice, leafless or nearly so. *Stems* many, as thick as a goose-quill or less, smooth or with pubescent tips. *Leaves* (when present) ½ in. long, thick, ovate or oblong, acute, nerves inconspicuous. *Cymes* many-flowered, often opposite, ¼-1 in. long and broad, on short thick peduncles or branching from the base; bracts

ovate-oblong, caducous from above the base. *Flowers* fragrant. *Calyx* glabrous,  $\frac{1}{2}$  in. long; lobes ovate-oblong, obtuse. *Corolla* greenish and glabrous outside, purple within; lobes reflexed,  $\frac{1}{2}$  in. long, oblong, obtuse, densely bearded inside towards the apex. *Corona-lobes*  $\frac{1}{2}$  in. long, transversely oblong at the base, each terminating in a long filiform process with a recurved apex. *Stamens* with glabrous filaments. *Follicles* on short thick peduncles, widely divaricate, 3-7 in. long, woody, terete, tapering to a point. *Seeds*  $\frac{1}{4}$  in. long, coma 1 in. long.

Merwára (D. Brandis). Flowers Mar.-April. **DISTRIB.** Plains of Sind and Punjab, Salt Range, lower slopes of the Outer Himalaya eastwards to the Chenab; abundant also in Afghanistan and Baluchistan, extending to Persia, Arabia and Egypt. The fragrant flowers are eaten. The stems yield a fibre which is used for making well-ropes. The milky juice is employed medicinally.

2. *P. calophylla*, *Falc. in Proc. Linn. Soc. i*, 115; *Brand. For. Fl.* 330; *F. B. I. iv.* 12; *Kanjilal For. Fl.* 239; *Gamble Man. Ind. Timb.* 490. *Streptocaulon calophyllum*, *Wight*; *Royle Ill.* 273.—**Vern.** Párn (Jaunsar).

A small glabrous twining shrub with slender branches. *Leaves* shortly petioled,  $1\frac{1}{2}$ -3 in. long, narrowly lanceolate, caudate-acuminate, coriaceous, shining on both surfaces, margins undulate; lateral nerves many, parallel, uniting within the margin, petiole  $\frac{1}{4}$  in. long. *Bracts* minute, scarious. *Calyx-lobes* broadly ovate, obtuse. *Corolla*  $\frac{1}{2}$  in. in diam., pinkish or pale yellow. *Corona-lobes* hairy. *Follicles* 4-6 in. long, straight or curved, conniving, tapering gradually to the apex. *Seeds* linear,  $\frac{1}{2}$ - $\frac{2}{3}$  in. long, coma  $1\frac{1}{2}$  in. long.

Dehra Dun at Sahánsradhára (Royle, etc.) Flowers during April and May. **DISTRIB.** Temp. and subtropical Himalaya from the Chamba to Sikkim up to 7,000 ft., usually in shady ravines; also in Assam and on the Khasia Hills, extending to China.

#### 4. CALOTROPIS, R. Br.; *Fl. Brit. Ind.* iv, 17.

Erect glabrous or hoary shrubs, or small trees. *Leaves* opposite broad, subsessile. *Flowers* large, arranged in umbellate cymes. *Calyx* divided to the base; sepals broadly ovate, glandular within. *Corolla* broadly campanulate or subrotate; lobes broad, naked valvate. *Corona* of 5 fleshy laterally compressed scales radiating from the large staminal column, their bases terminating in an up-curved or involute spur. *Filaments* connate into a tube; anthers short, broad, tipped with membranous inflexed appendages; pollen-masses solitary in each cell, pendulous, waxy. *Stigma* depressed, 5-angled or 5-lobed. *Follicles* short, turgid, smooth. *Seeds* comose.—Species 4, in Trop. Asia and Africa.

Leaves sessile or nearly so.

Corolla-lobes spreading . . . . . 1. *C. gigantea*.

Corolla-lobes erect . . . . . 2. *C. procera*.

Leaves distinctly petioled, corolla-lobes erect 3. *C. Acia*.

1. *C. gigantea*, R. Br. in Ait. Hort. Kew. ed. 2, ii, 78; Ham. in Trans. Linn. Soc. xiv, 245; Royle Ill. 275; Brandis For. Fl. 331; F. B. I. iv, 17; Watt E. D.; Kanjilal For. Fl. 240; Gamble Man. Ind. Timb. 491; Prain Beng. Pl. 688; Cooke Fl. Bomb. ii, 151. *Asclepias gigantea*, Willd.; Roxb. Fl. Ind. ii, 30.—Vern. Mudár, safed ák.

A large shrub 8-10 ft. high or occasionally subarborescent; bark ash-coloured, wrinkled; young parts and under surface of leaves covered with appressed white floccose tomentum. Leaves sessile, thick, glaucous-green, 4-8 in. long, elliptic or obovate-oblong, acute or shortly acuminate, with a narrow cordate or often amplexicaul base. Flowers 1½-2 in. in diam., arranged in umbellate cymes, not scented, buds ovoid. Sepals ½ in. long, ovate, acute. Corolla ¾-1 in. in diam., purplish or white; lobes ½ in. or more, spreading, deltoid, subacute. Corona-lobes ½ in. long, hairy, shorter than the column, curved on the back above the involute obtuse spur; apex rounded, with two obtuse auricles just below it. Follicles 3-4 in. long, recurved, turgid, smooth. Seeds ¼ in. long, broadly ovate, flat, minutely tomentose, with a silky white coma.

Common in many parts of the area as a weed on fallow land and in waste ground. Flowers and fruits throughout the year. DISTRIB. Throughout the hotter parts of India and in Ceylon, Malay Pen. and Islands, Burma, Siam to S. China. A valuable fibre is obtained from the stem of this plant, and the floss of the seeds is largely used for stuffing pillows. Almost every part of the plant possesses medicinal properties. Gunpowder charcoal is prepared from the wood and the sap yields a kind of gutta-percha. Garlands composed of the bluish-coloured corona of the flowers are used at religious ceremonies.

2. *C. procera*, R. Br. in Ait. Hort. Kew. ed. 2, ii, 78; Ham. in Trans. Linn. Soc. xiv, (1825). 246; Royle Ill. 275; Brandis For. Fl. 331; Watt E. D.; F. B. I. iv, 18; Kanjilal For. Fl. 241; Gamble Man. Ind. Timb. 491; Collett Fl. Siml. 315; Prain Beng. Pl. 689; Cooke Fl. Bomb. ii, 152.—Vern. Ak, madár.

A large shrub 6-8 ft. high, very similar in foliage and general appearance to the preceding. Flowers about 1 in. across, scented, buds hemispherical. Corolla pink, with purple spots; lobes ¾ in. long, erect. Corona-lobes ½ in. long, glabrous, equalling or exceeding the staminal column, straight or nearly so on the back above the acute upcurved spur, the apex bifid and without auricles. Follicles and seeds as in *C. gigantea*.

Common within the area, but chiefly in the sub-Himalayan tracts eastwards to the Sarda, also in Bundelkhand. Flowers Mar. to May. DISTRIB. In the hot and drier parts of India from the Punjab and Sind to W. and C. India, extending through Afghanistan, Persia and

Arabia to Egypt and Trop. Africa. This plant possesses properties very similar to those of the preceding.

3. *C. Acia*, Ham. in. Trans. Linn. Soc. xiv, 247; F. B. I. iv, 18, Watt E. D.; Kanjilal For. Fl. 241; Gamble Man. Ind. Timb. 491; Prain Beng. Pl. 659. *Asclepias herbacea*, Roxb. Fl. Ind. ii, 50.

*Stems* herbaceous. *Leave* petioled, 6-9 by 3-4 in., obovate oblanceolate or oblong, acute or abruptly acuminate at the apex, tapering towards the base, clothed beneath when young with deciduous white floccose tomentum; midrib very stout; main lateral nerves about 6 pairs, prominent beneath, arcuate; petiole  $\frac{1}{2}$ -1 in. long. *Flowers* about 1 in. across, arranged in compound umbels. *Calyx* about half as long as the corolla; lobes lanceolate, acuminate, green tinged with pink, floccose-tomentose outside. *Corolla* greenish at the base, purplish above; lobes erect,  $\frac{1}{2}$  in. long, tapering to an acuminate apex, margins undulate. *Corona-lobes* glabrous, pink, shorter than the staminal column, with 2 obtuse auricles below the bifid apex, basal spur abruptly incurved. *Follicles* subglobose, up to 4 in. long.

Dekra Dun, in grassy places at Kánsrao and Lachiwala, etc.; and also in the sub-Himalayan tracts of Pilibhit, Kheri and Bahraich. **DISTRIB.** Eastwards to N. and E. Bengal, Sikkim and Assam. This species may be readily distinguished by its stalked leaves. The juice of this plant is very acrid.

## 5. PENTABOTHTHA, Hook. f.; Fl. Brit. Ind. iv, 18.

A dwarf erect glabrous herb. *Leaves* opposite, linear. *Flowers* medium-sized, in axillary umbelliform short-peduncled cymes. *Calyx* 5-partite, minutely glandular within. *Corolla* campanulate, deeply 5-lobed; lobes oblong-ovate, overlapping to the right. *Corona* of 5 pouch-like folds at the base of the staminal column alternating with the anthers, and 5 fleshy laterally compressed processes with free obtuse tips adnate longitudinally to the backs of the anthers. *Anthers* large, horny, membranous, tips large and oblong; pollen masses one in each cell, elongate, compressed, falcate, with long caudicles, pendulous, waxy. *Stigma* a depressed 5-angled cone, included. *Fruit* not seen.—A single species confined to India.

*P. nana*, Hook. f. Ic. Pl. 1426; F. B. I. iv, 19. *Cynanchum nanum*, Ham. in Wight Contrib. 59.

*Stems* 5-8½ in. high, rigid, divided below. *Leaves* 2-4 by  $\frac{1}{4}$ - $\frac{1}{2}$  in., those about the middle of the stem the longest, spreading, linear, acute, base cordate, midrib stout, nerves faint, petiole  $\frac{1}{10}$  in. long. *Umbels* clustered, many-flowered, pedicels  $\frac{1}{4}$  in., bracts lanceolate. *Sepals* linear-lanceolate, puberulous. *Corolla*  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., reddish purple within and glabrous, lobes with ciliate edges.

Found at Garah in the Pilibhit district of Rohilkhand by Duthie's collector. Flowers in May. DISTRIB. N. Kamrup in Lower Assam (Hamilton and G. Mann). Sir Joseph Hooker, by whom the genus was founded, regards it as being most nearly related to *Holostemma*.

## 6. HOLOSTEMMA, R. Br. Fl. Brit. Ind. iv, 21.

Twining glabrous shrubs. *Leaves* opposite, cordate. *Flowers* large, fragrant, purple within, arranged in lax sublateral peduncled cymes. *Calyx* 5-partite, without glands inside, lobes ovate. *Corolla* subrotate, deeply 5-fid.; lobes thick, ovate, overlapping to the right. *Corona* a fleshy truncate ring, adnate to the base of the 10-winged staminal column. *Filaments* connate, anther-wings large, decurrent to the base of the column; pollen-masses solitary in each cell, elongate, compressed, waxy, pendulous by a long caudicle. *Follicles* slender, cylindric, somewhat tapering. *Seeds* comose.—Species 2, one in India, the other Chinese.

*H. Rheedianum*, Spreng. Syst. i, 851; Cooke Fl. Bomb. ii, 156. *H. Rheedei*, Wall.; F. B. I. iv, 21; Watt E.D. Collett Fl. Siml. 316; Prain Beng. Pl. 690. *H. Brunonianum*, Royle Ill. 276, t. 66. *Asclepias annularis*, Roxb. Fl. Ind. ii, 37.—Vern. Ráni Marwi (Dehra Dun).

A large much-branched almost glabrous twining shrub. *Stems* glabrous, shining. *Leaves* 3-5 by 2-3 in., ovate, acute or acuminate, deeply cordate with rounded basal lobes, glabrous above, finely pubescent beneath especially on the nerves; midrib minutely glandular at its base; nerves reticulate, red; petioles  $\frac{1}{2}$ -2 in. long. *Flowers* in umbellate or subracemose cymes, subglobose, reddish purple inside, white or pinkish outside; peduncles and pedicels 1-2 in. long. *Calyx*-lobes  $\frac{1}{2}$  in. long. *Corolla*-lobes  $\frac{1}{2}$  in. long, ovate, oblong, obtuse. *Follicles* 4-5 in. long, oblong, tapering to a blunt point. *Seeds*  $\frac{1}{2}$  in. long, thin, flattened, coma  $\frac{3}{4}$ -1 in. long.

Dehra Dun and Siwalik Range, also in the Bahraich district of N. Oudh. Flowers in July and Aug. DISTRIB. Himalaya up to 5,000 ft. westwards to Simla and eastwards to Sikkim, Bombay, S. India, Ceylon and Burma, also in China.

## 7. OXYSTEMMA, R. Br. Fl. Brit. Ind. iv, 17.

Twining glabrous herbs or undershrubs. *Leaves* narrow opposite. *Flowers* large, in lax racemose or umbelliform cymes, or solitary, pedicels filiform. *Calyx* small, 5-partite, glandular within, lobes acute. *Corolla* broadly saucer-shaped. *Corolla-tube* very short, with a ring of hairs within the mouth; limb divided

half-way down, lobes triangular, acute, valvate at the base, tips overlapping to the right in bud. *Corona-scales* 5, erect, ovate or lanceolate, attached to the staminal column, 2-keeled within. *Stamens* inserted at the base of the corolla-tube; filaments short, connate; anthers erect, tipped with an inflexed membranous appendage; pollen-masses one in each cell, oblong, compressed, pendulous waxy. *Stigma* depressed or subconvex, not exerted beyond the anthers. *Follicles* oblong and obtuse, or lanceolate and acute, often solitary. *Seeds* comose.—Species 4, in Trop. Asia and Africa.

*O. esculentum*, R. Br. in Mem. Wern. Soc. i, 40; Royle Ill. 274; F. B. I, iv, 17; Watt E. D.; Prain Beng. Pl. 688; Cooke Fl. Bomb. ii, 153 *Periploca esculenta*, Linn. f.; Roxb. Cor. Pl. i, 13. t. 11. *Asclepias rosea*, Roxb. Fl. Ind. ii, 40.

A glabrous climbing perennial herb. *Stems* many, slender, much branched. *Leaves* deciduous, thin, pale green, 1½-4 in. long, lanceolate or linear, acute or acuminate, the base acute rounded or cordate, petioles ½ in. long, very slender. *Flowers* drooping, 1 in. or more in diam.; peduncles slender, often exceeding the leaves. *Calyx-lobes* oblong-lanceolate, acute. *Corolla* rotate, rose-coloured with purple veins or nearly white; lobes ¾ in. long, with ciliate edges. *Corona-scales* acuminate, with incurved subulate tips. *Style-apex* slightly convex. *Follicles* glabrous, 2-2½ in. long, ovoid-lanceolate, tapering to a point. *Seeds* many, ½ in. long, broadly ovate, flat; coma ¾ in. long.

Found in many parts of the area, especially in the sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand, usually growing near water. Flowers Sept.-Dec. **DISTRIB.** Punjab to Ceylon, Bombay, N. and E. Bengal, Burma, extending to China and Java. The fruit is said to be eaten in Sind, and the milky juice and roots are used medicinally.

#### 8. PENTATROPIS, R. Br.; Fl. Brit. Ind. iv, 19.

Slender twining herbs or undershrubs. *Leaves* opposite, petioled, usually small. *Flowers* small, on slender pedicels, arranged in axillary umbelliform cymes, purplish. *Calyx* 5-partite. *Corolla* rotate, 5-partite; lobes elongate, overlapping to the right, twisted to the left. *Corona* of 5 laterally compressed scales adnate vertically to the backs of the anthers. *Stamens* attached to the base of the corolla, filaments connate, anthers with membranous inflexed appendages; pollen-masses one in each cell, not compressed, pendulous, waxy. *Stigma* subtruncate. *Follicles* small, glabrous, lanceolate and with narrowed beak. *Seeds* comose.—Species about 6, in Trop. Asia, Africa and Australia.



**P. cynanchoides**, R. Br. in *Salt. Voy. Abyss., Append.* p. 64; *Cooke Fl. Bomb. ii*, 154. **P. spiralis**, Dene; *F. B. I. iv*, 19; *Watt E. D.*; *Edgew. in Journ. Linn. Soc. vi*, 204, t. 1, f. 9.

A small twining shrub with tuberous roots, almost glabrous. *Leaves*  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, variable in width, ovate oblong or linear, acute or obtuse; usually mucronate, more or less fleshy, base rounded or cordate. *Petioles* slender,  $\frac{1}{10}$ - $\frac{1}{3}$  in. long, puberulous when young. *Cymes* 3-6-fl. *Flowers* greenish; peduncles short or none, pedicels  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, filiform. *Calyx* minute, deeply divided, puberulous; lobes ovate, acuminate. *Corolla*  $\frac{1}{2}$  in. in diam., divided nearly to the base; segments  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, narrowly acuminate, glabrous outside, puberulous within. *Corona-scales* deltoid-ovate, acute or acuminate. *Follicles* 2-3 in. *Seeds*  $\frac{1}{3}$  in. long, ovate, flat, minutely crenate at the lower end.

In the dry western and south-western portions of the area, abundant in the Jumna and Chambal ravines. *Flowers* in Feb. *DISTRIB.* Throughout the Sind and Punjab plains, extending through Afghanistan and Baluchistan to Arabia and Tropical Africa. The flowers are used medicinally, and Stewart mentions that the sweet tubers are often eaten.

#### 9. DÆMIA, R. Br.; *Fl. Brit. Ind.* iv, 20.

Twining pubescent or tomentose herbs or undershrubs. *Leaves* opposite, cordate. *Flowers* in lateral racemose or corymbiform peduncled cymes. *Calyx* 5-partite, glandular within. *Corolla-tube* short, cylindric or campanulate; lobes 5, large, ovate, spreading, overlapping to the right. *Corona* double; outer at the base of the staminal-column, annular, membranous, with 5 truncate or denticulate lobes; inner of 5 erect fleshy lobes, spurred at the base, adnate to the staminal column up to the anthers, free above and produced into inflexed subulate horns. *Anthers* erect, with a membranous inflexed appendage; pollen-masses one in each cell, compressed, pendulous, waxy. *Stigma* exserted. *Follicles* lanceolate, usually echinate. *Seeds* comose.—Species 6, in Trop. and Subtrop. Asia and Africa.

**D. extensa**, R. Br. in *Mem. Wern. Soc. i*, 50; *Royle Ill.* 272; *F. B. I. iv*, 20; *Watt E. D.*; *Collett Fl. Siml.* 315; *Prain Beng. Pl.* 692; *Cooke F. Bomb. ii*, 155. *Asclepias echinata*, Roxb.; *Fl. Ind.* ii, 44.

A twining subhispid perennial foetid herb. *Stems* clothed with short stiff spreading hairs. *Leaves* long-petioled, membranous, 2-4 in. long, broadly ovate, acuminate, glabrous or slightly pubescent above, hispid beneath especially on the veins, deeply cordate at the base, basal lobes rounded and incurved, margins ciliate. *Flowers* pale yellowish-green tinged with pink at the base, corymbose at first then racemose; peduncles 2-6 in. long, pubescent; pedicels capillary,  $\frac{1}{2}$ -2 in. long. *Calyx* divided almost to the base, pubescent; lobes  $\frac{1}{2}$ -in. long, ovate-lanceolate, acute, ciliate. *Corolla*  $\frac{3}{4}$  in. long; lobes twice as long

as the campanulate tube, ovate, acute; margins ciliate. *Follicles* reflexed, 2-3 by  $\frac{1}{2}$  in., covered with long soft spines, lanceolate, beaked. *Seeds*  $\frac{1}{4}$  in. long, ovate, crenate at the rounded base, densely pubescent.

Abundant within the area. Flowers Jan.-April. *DISTRIB.* Throughout the hotter parts of India and in Ceylon, ascending to 3,000 ft. on the Himalaya; also in Afghanistan, extending to Arabia and Tropical Africa. The fibre of the stem has been recommended as a promising substitute for flax. The leaves and juice are used medicinally.

# 10. GYMNEMA, R. Br.; Fl. Brit. Ind. iv, 28.

Twining shrubs. *Leaves* opposite. *Flowers* small, in crowded umbelliform cymes. *Calyx* 5-partite. *Corolla* subrotate campanulate or urceolate; lobes thick, overlapping to the right. *Corona* adnate to the corolla-tube, the tips more or less incurved, or of 5 pairs of fleshy ridges alternating with the corolla-lobes towards the base of the tube. *Staminal-column* attached to the base of the corolla; anthers short, erect, with short membranous tips; pollen-masses solitary in each cell, erect, waxy. *Stigma* large, often exserted. *Follicles* slender or turgid, smooth, acuminate. *Seeds* comose.—Species 20-25, in Asia, Africa and Australia.

Corona-scales protruded beyond the sinuses of the corolla-lobes.—Large pubescent woody climbers:—

More or less pubescent, cymes distinctly peduncled, corolla about  $\frac{1}{2}$  in. in diameter . . . . .

1. *G. sylvestre*.

Softly rusty-tomentose, cymes subsessile, corolla about  $\frac{1}{4}$  in. in diameter . . . . .

2. *G. hirsutum*.

Corona-scales not produced beyond the sinuses of the corolla-lobes.—An extensive almost glabrous climber . . . . .

3. *G. tingens*.

*sylvestre*, R. Br. in Mem. Wern. Soc. i, 33; Royle Ill. 273; Brandis Ind. Trees 469; F. B. I. iv, 29; Watt E. D.; Gamble Man. Ind. Timb. 492; Cooke Fl. Bomb. ii, 160. *G. melicida*, Edgew. in Journ. As. Soc. Beng. xxi (1852), 174. *Asclepias geminata*, Roxb.; Fl. Ind. ii, 45.—Vern. Gurmar (Bundelkhand).

A large more or less pubescent climbing shrub; young stems and branches terete, pubescent. *Leaves* subcoriaceous, 1-2 $\frac{1}{2}$  in. long, elliptic or ovate, acute or shortly acuminate, cuneate rounded or cordate at the base, often glabrous above, more or less pubescent beneath, especially on the veins; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* yellow, in umbellate

cymes; peduncles shorter than the petioles, densely tomentose; pedicels slender,  $\frac{1}{2}$ — $\frac{3}{4}$  in. long. *Calyx* pubescent, deeply divided; lobes  $\frac{1}{2}$  in. long, oblong, obtuse, ciliolate. *Corolla*  $\frac{1}{2}$  in. across: lobes glabrous, about as long as the campanulate tube, thick, triangular, obtuse, recurved. *Corona-lobes* protruded beyond the sinuses of the corolla-lobes. *Anthers* white. *Style*—apex exserted. *Follicles* 2-3 in. long, lanceolate, tapering into a beak, glabrous. *Seeds*  $\frac{1}{2}$  in. long, narrowly ovoid-oblong, flat and broadly margined, pale-brown.

Bundelkhand (Edgeworth), Saharanpur district (Jameson). Flowers during April and May. **DISTRIB.**: Bombay, S. India, extending to Trop. Africa. The leaves of this plant, if chewed, have the peculiar property of temporarily removing the sense of taste. The powdered root is regarded by natives as a remedy for snake-bites.

2. *G. hirsutum*, W. & A. *Contrib.* 44; F. B. I. iv, 29; Gamble *Man. Ind. Timb.* 492; Prain *Beng. Pl.* 694; Brandis *Ind. Trees* 469.

A large stout woody climber. Young stems and inflorescence densely clothed with rust-coloured pubescence. *Leaves* rather thick, 1-2 $\frac{1}{2}$  in. long, broadly ovate, acute or acuminate, often cordate at the base, softly tomentose on both surfaces, especially on the prominent nerves beneath; petioles stout,  $\frac{1}{4}$ — $\frac{1}{2}$  in. long. *Cymes* few or many-flowered, subsessile. *Flowers* larger than those of *G. sylvestre*. *Calyx* pubescent, half as long as the corolla; lobes ovate, rounded. *Corolla*  $\frac{1}{2}$  in. in diam., lobes ciliolate. *Follicles* nearly straight, 2-2 $\frac{1}{2}$  in. long, glabrous. *Seeds*  $\frac{1}{2}$  in. long, ovate-oblong, flat, distinctly winged at the base, coma  $\frac{3}{4}$  in. long.

Bundelkhand (Mrs. Bell). **DISTRIB.** Behar, Nilgiris. I have not seen the Bundelkhand specimens. The single specimen at Kew from Behar is in fruit only, and although the leaves are pubescent on both surfaces it cannot, in the absence of flowers, be with perfect certainty referred to this species.

3. *G. tingens*, W. & A. *Contrib.* 45; Royle *Ill.* 273; F. B. I. iv, 31; Watt *E. D.*; Kanjilal *For. Fl.* 245; Gamble *Man. Ind. Timb.* 492; Prain *Beng. Pl.* 694; Brand. *Ind. Trees* 469. *Asclepias tingens* Roxb; *Fl. Ind.* ii, 53.

An extensive climber with soft glabrous branches. *Leaves* membranous bright green, glabrous on both surfaces, 4-6 in. long, broadly ovate usually cordate at the base, acute or caudate-acuminate; main lateral nerves 4-6 pairs, prominent beneath and pale-coloured, petioles 1-1 $\frac{1}{2}$  in. long. *Cymes* many-flowered, corymbose, at length spirally racemose, branches densely puberulous, peduncles shorter than the petioles, lower pedicels exceeding the peduncle. *Flowers*  $\frac{1}{2}$  in. across, pale-yellow. *Calyx* divided almost to the base; lobes linear-oblong, obtuse, margins ciliate. *Corolla-tube* with double villous ridges below the sinuses; lobes obliquely oval, glabrous. *Follicles* spreading, about 4 in. long, smooth, acute at both ends.

Dehra Dun (P. W. Mackinnon), Khera Pass in the Siwalik Range (Falcner), Gorakhpur (Vicary). Flowers during the rainy season, fruiting in Nov. and Dec. **DISTRIB.:** Trop. Himalaya from Kumaon to Sikkim, Assam and Lower Bengal, also in S. India and Burma, extending to China. Regarding the indigo-like dye said to be yielded by the leaves of this plant see Roxburgh l. c. 51.

## 11. GONGRONEMA, Dene. ; Fl. Brit. Ind. iv, 33.

Twining shrubs, glabrous or nearly so. *Leaves* opposite. *Flowers* small, in umbelliform or racemose axillary cymes. *Calyx* 5-partite, glandular or not within, lobes ovate. *Corolla* urceolate subrotate or broadly campanulate, lobes slightly overlapping to the right. *Corona* of 5 short scales adnate to the bases of the anthers, or none. *Stamens* attached to the base of the corolla-tube, filaments connate in a short column; anthers erect, with inflexed membranous tips concealing the stigma; pollen-masses solitary in each cell, erect ovoid, waxy. *Stigma* convex clavate or conical. *Follicles* acuminate. *Seeds* comose.—Species about 10, in Asia, Africa and Australia.

*G. nepalense*, Dene. in DC. Prod. viii, 624; F. B. I. iv, 33; Kanjilal For. Fl. 211; Prain Beng. Pl. 691 (var. *ragittatum*).

An extensive twining shrub: young parts and inflorescences rusty-puberulous. *Leaves* membranous, 3-6 in. long, broadly oblong-elliptic or ovate, acuminate, usually rounded at the base glabrous above, puberulous on the veins beneath; main lateral nerves 6-9 pairs, arcuate; petiole slender, 1-2 in. long. *Peduncles* 2-6 in. long, branching into three divaricate arms, each bearing three many-flowered umbelliform clusters; pedicels slender, up to  $\frac{1}{2}$  in. long. *Calyx-lobes* ovate. *Corolla* yellow,  $\frac{1}{2}$  in. in diam., lobes about as long as the tube. *Follicles* slender, 2-3 in. long. *Seeds* about  $\frac{1}{2}$  in. long, ovate, flat, margined, coma 1 in. long.

Dehra Dun, in shady ravines. **DISTRIB.:** Subtropical Himalaya eastwards from Kumaon to Sikkim, up to 4,000 ft.; also in Assam, on the Khasia Hills and in Chittagong, extending to China.

## 12. MARSDENIA, R. Br. ; Fl. Brit. Ind. iv, 34.

Twining, rarely erect, shrubs. *Leaves* opposite. *Flowers* medium-sized or small, in simple or branched, umbellate or corymbose, terminal or axillary cymes. *Calyx* 5-partite. *Corolla* campanulate urceolate or rotate, lobes overlapping to the right. *Corona* of 5 erect fleshy scales, adnate to the base of the staminal-column,

the free portion contiguous to the backs of the anthers. *Staminal-column* short, anthers with inflexed membranous tips, pollen-masses erect, one in each cell, waxy. *Stigma* flat convex or beaked. *Follicles* with a thick pericarp, smooth ribbed or winged. *Seeds* comose.—Species about 70, in tropical and subtropical regions of both hemispheres, one occurring in the Mediterranean region.

Corolla rotate, glabrous or hoary outside,  
glabrous within . . . . . 1. *M. volubilis*.

Corolla urceolate or subcampanulate.

Apex of style not exerted beyond the  
anther-tips :—

Corolla-lobes pubescent on both sides,  
corona-lobes much exceeding the anther-  
tips; follicles beaked, transversely  
rugose . . . . . 2. *M. Roylei*.

Corolla-lobes pubescent outside, glabrous  
within, corona-lobes not exceeding the  
anther-tips; follicles not beaked, longi-  
tudinally rugose . . . . . 3. *M. tenacissima*.

Corolla-lobes glabrous on both sides . . . . . 4. *M. Hamiltoni*.

Apex of style exerted beyond the anther-  
tips; corolla-lobes glabrous outside,  
pubescent within . . . . . 5. *M. lucida*.

*M. volubilis*, T. Cooke *Fl. Bomb. ii*, 166. *Dregea volubilis*, Benth.  
*ex Hook. f. Fl. B. I. iv*, 46; Watt *E. D.*; Kanjilal *For. Fl.* 244; Gamble  
*Man. Ind. Timb.* 493; Prain *Beng. Pl.* 697; Brandis *Ind. Trees* 468.  
*Asclepias volubilis*, Linn. *f.*; Roxb. *Fl. Ind. ii*, 36; Hoya *Lacuna*, Buch.  
*Ham. in Wall. Cat.* 8169.

A large twining shrub, glabrous or hoary-tomentose. Bark of old  
branches often lenticellate and pustular. *Leaves* glabrous or softly  
tomentose, subcoriaceous, 2½-6 by 2-4½ in., broadly ovate or suborbicular,  
acuminate, base rounded or cordate; main lateral nerves 4-5, branching  
into fine reticulate veins; petioles stout, ½-2½ in. long. *Flowers* ½-¾ in.  
across, green or yellowish green, arranged in slender drooping axillary  
or interpetiolar umbelliform cymes; peduncles usually longer than the  
petioles, slender, puberulous; pedicels ¼-1 in. long, very slender.  
*Calyx* deeply divided; segments ovate-oblong, obtuse or subacute.  
*Corolla* rotate, glabrous or hoary outside, glabrous within, divided  
nearly to the base; lobes ½ in. long, triangular-ovate. *Corona-lobes*  
large and fleshy; upper free portion rounded on the outer margin and  
with an obliquely truncate apex, inner margin cuspidate. *Staminal-*  
*column* arising from near the base of the corolla. *Follicles* 3-4 in. long

tapering to a blunt point, longitudinally ribbed, velvety when young. Seeds about  $\frac{1}{2}$  in. long, broadly ovate and with a wide margin; coma about  $1\frac{1}{2}$  in. long, white.

Abundant within the area. Flowers April-June, fruiting during the cold season. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon; it occurs in the Himalayan region up to 5,000 ft. from Bashahr eastwards, and extends to China and Java. The stems yield a very strong fibre which is much used for the manufacture of rope and thread. The leaves are used as an application for boils, and many other parts of the plant are employed medicinally. The plant is easily recognized when in blossom by the large umbels of bright green flowers. *Hoya Lacuna* of Buch.-Ham. appears to be merely a more pubescent form of the species.

2. *M. Roylei*, W. & A. in *Wight Contrib.* 40; *Royle Ill.* 273; *Brandis For. Fl.* 333; *Ind. Trees*, 470; *F. B. I.* iv, 35; *Watt E. D.*; *Kanjilál For. Fl.* 242; *Gamble Man. Ind. Timb.* 492; *Collett Fl. Siml.* 318, fig. 99.

A softly tomentose twining shrub. Leaves 3-6 in. long, broadly ovate, acuminate, velvety beneath, base cordate; petiole  $1\frac{1}{2}$ -2 in. long. Flowers in compact peduncled corymbose cymes,  $\frac{1}{2}$  in. long, pale-orange. Calyx about half as long as the corolla, pubescent outside. Corolla fleshy; lobes as long as the tube, villous on both sides. Corona-appendages flat, linear, erect, much exceeding the anther-tips. Follicles about 3 in. long, turgid, beaked, transversely rugose, puberulous. Seeds  $\frac{1}{2}$  in. long, ovate, flat, margined.

Dehra Dun and Siwalik Range. Flowers May and June. **DISTRIB.:** Himalaya up to 7,000 ft. from Hazara to Sikkim. The milky sap contains a small quantity of caoutchouc. The stems yield a strong fibre suitable for fishing lines.

3. *M. tenacissima*, Wight & Arn. in *Wight Contrib.* 41; *Royle Ill.* 274; *Fibrous Pl. of Ind.* 304; *Brand. For. Fl.* 333; *Ind. Trees* 470; *F. B. I.* iv, 35; *Watt E. D.*; *Kanjilál For. Fl.* 243; *Gamble Man. Ind. Timb.* 492. *Prain Beng. Pl.*, 696; *Cooke Fl. Bomb.* ii, 165. *Asclepias tenacissima*, Roxb.; *Fl. Ind.* ii, 51.—Vern. *Jiti*, *marua bel*, *rání marua* (Dehra Dun) (*Rájmehál* hemp).

A large twining shrub. Bark of old stems grey and corky, deeply furrowed. Young parts, leaves beneath and inflorescence densely velvety and tomentose. Leaves 3-6 in. long by 3-4 in. wide, broadly ovate, acuminate, deeply cordate at the base with rounded lobes, both surfaces densely velvety-tomentose when young, becoming almost glabrous above when old; petioles 2-4 in. long, softly pubescent. Flowers greenish-yellow, in much-branched congested corymbose cymes, peduncles intrapetiolar. Calyx deeply divided; lobes  $\frac{1}{2}$  in. long, oblong-lanceolate, acute. Corolla  $\frac{1}{4}$  in. in diam., hairy outside; lobes shorter than the tube, oblong, obtuse, spreading, glabrous within.

*Corona-lobes* acate, not exceeding the anther-tips. *Follicles* 4-6 in. long, ovoid-lanceolate, longitudinally wrinkled, downy. *Seeds*  $\frac{1}{2}$  in. long, flattened, ovate-oblong.

Forests of Dehra Dun and Saharanpur, and in the sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand. Flowers in April and May, the fruit ripening during the cold season. **DISTRIB.:** W. Himalaya up to 4,500 ft eastwards to Kumaon, also in Gujarat, Rájmahál Hills, Chittagong, Burma, Ceylon, extending to Java and Timor. The stems of this plant yield a very strong elastic silky fibre which is much used for fishing lines by the Gurkhas in Dehra Dun. It is also made use of by the Sontháls in Lower Bengal for bow-strings. Both Roxburgh and Royle allude to the great value of this fibre. The milky juice of this plant, when solidified, forms a useful caoutchouc capable of removing pencil marks.

4. M. **Hamiltonii**, W. & A. in *Wight Contrib.* 41; F. B. I. iv, 36; *Brandis Ind. Trees* 470. *Cynanchum reticulatum*, *Herb. Ham.*

A suberect or climbing undershrub; branches petioles undersurface of leaves and inflorescence rusty-puberulous. *Leaves* coriaceous, pale-coloured on both sides; blade  $1\frac{1}{2}$ -3 $\frac{1}{2}$  in. long by 1-2 in. wide, oblong-ovate or lanceolate or suborbicular, obtuse or acute or obliquely acuminate, base cordate, margins slightly revolute; petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. *Cymes* corymbosely branched many flowered. *Calyx-lobes* suborbicular, puberulous outside. *Corolla*  $\frac{1}{10}$ - $\frac{1}{8}$  in. in diameter; lobes glabrous on both sides, throat densely villous. *Corona-lobes* membranous, subulate, exceeding the anther-tips. *Style-apex* not exerted, *Follicles* (only young ones seen) narrowly ovoid, obtusely pointed, wrinkled, puberulous.

Discovered in 1810 by Buchanan-Hamilton in N. Oudh, and by Edgeworth in the Sub-Siwalik tract. It has more recently been gathered by my plant collectors in several localities within the sub-Himalayan districts of Pilibhit, Kheri and Gorakhpur. Flowers April-June. **DISTRIB.:** Hill tracts of S. Garhwal. As usually met with, the primary stems of this species are arrested and congested into a thick woody rootstock, from which annual stems are produced. These latter commence to flower during the early summer, but are destroyed by the periodical jungle fires usually before the seed-vessels have time to develop and ripen. The type specimens collected by Buchanan-Hamilton in N. Oudh exhibit the ordinary dwarfed condition of this plant. Edgeworth's Sub-Siwalik specimens are more luxuriant, owing no doubt to the locality being more favourable for vigorous growth and to a great extent fire-proof. Some specimens recently collected in the Pilibhit district exhibit not only a more luxuriant development of stems and foliage, but also very distinctly the scandent habit which characterizes the genus. A fact of still greater interest in regard to these specimens is the presence of young follicles, no fruiting specimens of this species having previously been observed.

**5. M. lucida**, Edgew. ex Madden in Journ. As. Soc. Beng. xvii, pt. 1 (1843), 370; Brandis For. Fl. 333; Ind. Trees 470; F. B. I. iv, 36; Gamble Man. Ind. Timb. 492.

A large evergreen climber, glabrous all but the young parts and inflorescence. Leaves subcoriaceous, 4-5 in. long by 2-3 in. wide, elliptic or ovate, subacute or obtusely acuminate, rounded at the base, pale yellowish-green beneath, main lateral nerves 6-8 pairs; petioles 1-1½ in. long. Flowers many, purple, fragrant, in rather dense corymbiform cymes; peduncles stout, interpetiolar, shorter than the petioles. Calyx one-third the length of the corolla, pubescent outside, lobes obtuse. Corolla ½-¾ in. long and about ½ in. across; lobes longer than the tube, glabrous outside, sparsely hairy within, edges ciliate. Corona-scales subulate, as long as the anther-tips. Style much longer than the column, bifid at the apex. Follicles about 5 in. long, lanceolate, smooth. Seeds ¾ in. long, ovate-lanceolate, margined; coma 1½ in. long.

Forests in the Bahraich district of N. Oudh. Flowers in Oct. and Nov. **DISTRIB.**: Kumaon, in shady spots up to 7,500 ft. (Madden and S. & W. No. 4), also in E. Bengal. The beautiful foliage of this plant and its fragrant purple flowers merit the attention of horticulturists.

### 13. PERGULARIA, Linn.; Fl. Brit. Ind. iv, 37.

Twining shrubs. Leaves opposite, ovate-cordate, membranous. Flowers greenish or yellow, rather large, arranged in lateral subumbellate cymes. Calyx 5-partite. Corolla salver-shaped, tube swollen at the base, lobes overlapping to the right. Corona adnate to the lower portion of the staminal column, free portion 5-lobed and with a narrow process on the face of each lobe. Staminal column attached to the base of corolla; anthers erect, with long membranous inflexed appendages; pollen-masses one in each anther-cell, erect, waxy, caudicles short. Stigma stout, umbonate, capitate. Follicles lanceolate, rather turgid. Seeds comose.—Species about 10, Asiatic and African.

**P. pallida**, W. & A. in Wight. Contrib. 42; Royle Ill. 273; Brand. For. Fl. 334; Ind. Trees 470; F. B. I. iv, 38; Kanjilál For. Fl. 243; Gamble Man. Ind. Timb. 493; Collett Fl. Siml. 319; Prain Beng. Pl. 696; Cooke Fl. Bomb. ii, 165. *Asclepias pallida*, Roxb. Fl. Ind. ii, 48.—Vern. *Surkila*.

A large twining shrub. Bark of old stems becoming corky. Branches pale-coloured, softly pubescent when young. Leaves membranous, glabrous or somewhat pubescent when young, 2-4 in. long, ovate, acute or acuminate, cordate at the base, pale and finely reticulate beneath; petioles ½-2 in. long, pubescent. Flowers pale-yellow, often slightly fragrant; peduncles interpetiolar, pubescent, pedicels about ½ in. long.



*Calyx*  $\frac{1}{2}$  in. long, pubescent; segments subulate, margins ciliate. *Corolla*  $\frac{3}{4}$  in. long, divided more than half-way down; lobes linear, obtuse, glabrous. *Corona-scales* linear, each with a long beaked process projecting from the inner edge. *Follicles* 3-4 in. long, tapering to a blunt point from rather a turgid base, longitudinally ribbed, glabrous. *Seeds*  $\frac{2}{3}$  in. long, flat, ovate, broadly margined, pale-brown, glabrous.

Dehra Dun, Moradabad, N. Oudh, Agra, Bundelkhand and Merwara. Flowers May-July. **DISTRIB.:** Trop. Himalaya up to 5,000 ft. from Murree eastwards to Sikkim and southwards to Bombay and C. India, also in Burma.

*P. minor*, Andr. is cultivated in Indian gardens, and is found wild on the Himalaya as far west as Jaunsar. It is also a native of China. It is sometimes known as the "West Coast" or "Primrose Creeper".

#### 14. TYLOPHORA, R. Br., Fl. Brit. Ind. iv, 39.

Twining (rarely erect) herbs or undershrubs. *Leaves* opposite. *Flowers* small, arranged in simple or branched lateral or axillary umbelliform racemose or fascicled cymes. *Calyx* 5-partite, lobes ovate or lanceolate. *Corolla* rotate, deeply 5-fid.; lobes broad, slightly overlapping to the right. *Corona* of five fleshy tubercles, adnate wholly or in part to the very short staminal-column. *Anthers* very small, with a membranous inflexed appendage; pollen-masses minute, one in each cell, globose or ovoid, waxy, erect or ascending, rarely horizontal; caudicles very slender. *Stigma* disciform, 5-gonal, usually included. *Follicles* acuminate, smooth, occasionally winged. *Seeds* comose.—Species about 40, in the tropical and subtropical regions of Asia, Africa and Australia.

Stems short, erect or subscandent, puberulous above . . . . . 1. *T. fasciculata*.

Stems long and twining:—

*Calyx* glabrous, coronal processes gibbous . . . . . 2. *T. himalaica*.

*Calyx* hairy:—

*Corona* wholly adnate to the staminal

column and without free points:—

*Leaves* ovate or ovate-lanceolate, cymes

few-flowered . . . . . 3. *T. hirsuta*.

*Leaves* orbicular or broadly ovate,

cymes many flowered . . . . . 4. *T. rotundifolia*.

Tips of corona-scales free . . . . . 5. *T. tenerrima*.

1. *T. fasciculata*, Buch.-Ham. in Wight Contrib. 50; F. B. I. iv, 40; Watt E. D.; Cooke Fl. Bomb. ii, 162.

Root-fibres stout, cord-like. *Stems* several from the root, 12-18 in. high, erect flexuous or subscandent, finely puberulous upwards. *Leaves* petioled, thinly coriaceous, approximate in pairs, diminishing in size

upwards, 1-2 in. long, ovate or lanceolate, acute, cuneate or rounded at the base, glabrous above, puberulous on the veins beneath, petiole  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. *Flowers* in lateral umbelliform or racemose cymes; peduncles interpetiolar, slender, puberulous, pedicels filiform; bracts minute, linear-lanceolate. *Calyx-segments*  $\frac{1}{2}$  in. long, lanceolate, acute pubescent. *Corolla*  $\frac{1}{2}$  in. long; lobes ovate-lanceolate, acute, sometimes fleshy. *Pollen-masses* subtransverse. *Follicles*  $1\frac{1}{2}$ -2 in. long, ovoid-lanceolate, acute, longitudinally striate, glabrous. *Seeds*  $\frac{1}{2}$  in. long, broadly ovoid, flat.

Sub-Himalayan tracts of Rohilkhand, N. Ondh and Gorakhpur. *Flowers* during April and May. *DISTRIB.*: Eastwards to the Khasia Hills and southwards through W. and C. India to Ceylon.

2 *T. himalaica*, Hook. f. *F. B. I.* iv, 42.

A slender glabrous twining undershrub. *Stems* pale-coloured, finely striated. *Leaves* petioled, membranous; blade  $1\frac{1}{2}$ - $3\frac{1}{2}$  in. long, ovate-lanceolate, acuminate, acute or rounded at the base, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* green or purplish, in distant umbels on a long slender rachis; bracts minute, linear-lanceolate. *Calyx* glabrous; lobes lanceolate, ciliate on the edges. *Corolla* about 7 mm. across; lobes thick, ovate-oblong, obtuse, purplish and minutely puberulous inside. *Coronal processes* gibbous. *Follicles* 4-5 in. long, lanceolate, acuminate finely striate. *Seeds*  $\frac{1}{2}$  in. long, broadly ovate, margined; coma 1 in. long.

Sahánsradhára in Dehra Dun (Vicary, Falconer). *DISTRIB.* Himalaya eastwards to Sikkim up to 3,000 ft., also on the Khasia Hills.

3. *T. hirsuta*, W. & A in *Wight Contrib.* 49; *F. B. I.* iv, 43; *Collett Fl. Siml.* 319. *T. Jacquemontii*, Dene.

*Stems* long and twining, densely and softly tomentose. *Leaves* petioled, blade  $2\frac{1}{2}$ -5 in. long,  $1\frac{1}{2}$ -3 in. wide, ovate or ovate-lanceolate, acute or acuminate, rounded or cordate at the base, more or less pubescent or softly tomentose on both surfaces; petioles  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long. *Flowers* white or pale green, in distant few-flowered umbellate cymes; peduncles villous, varying in length, often long and flexuous, pedicels filiform. *Calyx-segments* lanceolate, hirsute. *Corolla*  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diameter, puberulous inside. *Coronal processes* subglobose, wholly adnate to the staminal column. *Follicles* 2- $2\frac{1}{2}$  in. long, lanceolate, tapering gradually upwards, finely striate and glabrous. *Seeds*  $\frac{1}{2}$  in. long, narrowly ovate, coma nearly 1 in. long.

Dehra Dun (P. W. Mackinnon). *DISTRIB.*: Trop. Himalaya up to 5,000 ft., from Kashmir eastwards to Kumaon, also in Assam, and extending to Java.

4. *T. rotundifolia*, Buch.-Ham. in *Wight Contrib.* 50; *F. B. I.* iv, 42 *Cooke Fl. Bomb.* ii, 163.

A small shrub with pubescent twining stems. *Leaves* coriaceous, shortly petioled; blade  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, broadly ovate-oblong or suborbicular,

rounded or emarginate at the apex and often macronate, base rounded or subcordate, almost glabrous above, more or less pubescent beneath, margins ciliate; petioles  $\frac{1}{8}$ - $\frac{1}{4}$  in. long. *Flowers* many, in peduncled or sessile umbellate cymes; peduncles interpetiolar, pubescent, pedicels many, filiform, up to 1 in. long, bracts lanceolate. *Calyx-segments*  $\frac{1}{2}$  in. long, narrowly lanceolate, hispid. *Corolla*  $\frac{1}{2}$  in. long glabrous; lobes elliptic, obtuse. *Corona-lobes* wholly adnate to the staminal column. *Style-apex* 5-gonal, not exerted beyond the anther-tips. *Follicles* about 2 in. long, broadly ovate, fusiform, glabrous. *Seeds* (immature)  $\frac{1}{2}$  in. long, ovate, flat, margined, coma 1 in. long.

Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie's collectors) Gorakhpur (Vicary). *Flowers* in June. *DISTRIB.*: Buchanan-Hamilton's type specimens were found by him in the Kamrup district of Assam. It was collected by Stocks in the Konkan, by Gamble in the Ganjam District of Madras and by Beddome on the Anamally Hills in Travancore. Although so widely distributed the plant is nowhere abundant. Gamble's Ganjam specimen is the only one I have seen in fruit.

5. *T. tenerima*. *Wight Contrib.* 50; *F. B. I.* iv, 44.

A glabrous or sparsely pubescent perennial climber with slender much branched stems. *Leaves* shortly petioled, 1-4 in. long by  $\frac{1}{10}$ - $\frac{1}{2}$  in. wide, ligulate or linear-lanceolate, obtuse acute or acuminate, rounded at the base, nerves usually obscure; petioles  $\frac{1}{2}$ - $\frac{1}{4}$  in. *Cymes* generally 4-flowered, on slender filiform peduncles which are often longer than the leaves; pedicels filiform,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* minute. *Calyx*  $\frac{1}{2}$  in. long; lobes lanceolate or ovate-lanceolate, hispid. *Corolla* dark purple,  $\frac{1}{2}$  in. in diam.; lobes linear-oblong, puberulous within. *Coronal scales* with free incurved cuspidate tips. *Follicles* not seen.

Dehra Dun (Vicary, Falconer). *DISTRIB.*: Himalaya from Kashmir to Sikkim up to 7,000 ft.

## 15. LEPTADENIA, R. Br.; Fl. Brit. Ind. iv, 63.

Twining or erect shrubs with rigid rush-like stems. *Leaves* opposite, sometimes absent. *Flowers* small, in crowded lateral umbelliform cymes. *Calyx* more or less deeply 5-lobed. *Corolla* rotate, 5-lobed, pubescent or bearded within, lobes valvate in bud. *Corona* of 5 short hair-tipped lobes between the corolla-lobes, sometimes with an inconspicuous fleshy ring at the base of the short staminal column. *Anthers* inflexed over the stigma, without terminal appendages; pollen-masses one in each cell, erect, globose, nearly sessile, tips pellucid. *Stigma* included, flat. *Follicles*



is found suitable for well-ropes in Sind, and sometimes in combination with that of *Periploca aphylla*. Mr. Lace states that the plant is much used in the Sibi district as a camel fodder.

16. **BRACHYSTEMA.** R. Br.; Fl. Brit. Ind. iv. 64.

Erect or twining pubescent or glabrous herbs with tuberous roots. *Leaves* opposite, sometimes very narrow or minute. *Flowers* few, in axillary sessile umbels, or solitary, pedicels very slender. *Calyx* 5-partite, with 5 glands or scales inside at the base. *Corolla* (in the Indian species) rotate; lobes 5, elongate, valvate. *Corona* double, adnate to the staminal column, annular, variously 5-10-lobed or toothed, lobes or teeth erect or incumbent on the anthers. *Staminal column* very short; anthers ovoid, tips without appendages, retuse; pollen-masses one in each cell, erect, sessile, globose, pellucid on the inner margin or near the apex. *Stigma* nearly flat. *Follicles* slender, smooth. *Seeds* comose.—Species 22, of which fourteen are African and the remainder inhabit India.

Leaves minute; flowers several, pendulous,  
in sessile umbels . . . . . 1. *B. lævigatum*.

Leaves manifest; flowers solitary in the  
axils, erect . . . . . 2. *B. pauciflorum*.

1. *B. lævigatum*, Hook. f. Fl. Br. Ind. iv. 65. *Eriopetalum lævigatum*, Wight Contrib. 35. *Gomphocarpus lævigatus*, Buch.-Ham.

*Root* the size of a small potato. *Stem* 12-18 in. high, pubescent upwards. *Leaves* minute, subulate. *Flowers* in sessile umbels, pendulous,  $\frac{2}{3}$  in diam.; pedicels minute, hispid. *Calyx* lobes  $1\frac{1}{2}$  in. long, subulate, hispid. *Corolla* pale dull-purple, with pale-green filiform segments three times as long as the tube, puberulous outside. *Corona* with five broad erect 2-toothed lobes between the anthers and as many narrow oblong ones opposite to them. *Follicles* 2-3 in. long, erect, subfalcate, tapering gradually to the apex. *Seeds* about  $\frac{1}{4}$  in. long, linear, margined, coma twice as long as the seed.

Found by Buchanan-Hamilton in the sub-Himalayan district of Gorakhpur in 1814, and not since met with. Flowers during March.

2. *B. pauciflorum*, Duthie.

Quite glabrous except the inflorescence. *Root* globose, about  $\frac{1}{2}$  in. in diam. *Stem* erect, 1-1 $\frac{1}{4}$  ft. high. *Leaves* 2-4 in. long, linear-lanceolate, sometimes falcate, tapering below into a short thick angular petiole, margins recurved, midrib thick and prominent underneath; lateral veins slender, ascending. *Flowers* solitary in the upper axils, about  $\frac{1}{2}$  in. across, pedicels slender, about 1 in. long, pubescent, bearing three

## 18. CEROPEGIA, Linn. ; Fl. Brit. Ind. iv, 66.

Twining, rarely erect, perennial herbs, often with a tuberous rootstock. *Leaves* opposite, sometimes minute or none. *Flowers* in lateral peduncled usually umbellate cymes, rarely solitary, often large, white or greenish and purple. *Calyx* 5-partite, lobes narrow. *Corolla-tube* elongate, straight or curved, often swollen at the base; lobes erect or incurved and with cohering tips, often at length recurved or reflexed, valvate in bud. *Corona* staminal, double, attached to the column; outer cupular, entire or toothed; inner more or less adnate to the outer, consisting of 5 lobes erect or incumbent over the anthers. *Staminal column* very short, adnate to the base of the corolla; anthers short, without appendages; pollen-masses one in each cell, short, erect or ascending, attached to the pollen-carriers by short caudicles or subsessile. *Stigma* included, truncate or shortly conical. *Follicles* usually slender, acuminate, smooth. *Seeds* comose.—Species 80 or more, in Trop. and Temp. Asia and Africa, also in Malaya and Australia.

*C. bulbosa*, Roxb. Cor. Pl. i, 11, t. 7; Fl. Ind. ii, 28; Royle Ill. 274; F. B. I. iv, 67; Cooke Fl. Bomb. ii, 176.

A twining perennial herb; rootstock tuberous, somewhat flattened like a turnip, emitting many fibrous roots from below. Stems very slender, usually glabrous. *Leaves* extremely variable. (In typical *C. bulbosa* they are petioled and up to 2 in. long, the lowest almost orbicular, the upper elliptic-oblong or obovate, usually apiculate and with a rounded truncate subcordate or acute base.) *Flowers* few, in peduncled umbellate cymes; peduncle  $\frac{1}{2}$ –1 in. long, pedicels much shorter. *Calyx-segments*  $\frac{1}{2}$  in. long, lanceolate, acute. *Corolla* less than 1 in. long, greenish, tube inflated at the base; lobes  $\frac{1}{6}$  in. long, linear from a triangular base, violet-purple and villous within. Outer *corona-lobes* 5, minute, inner filiform. *Follicles* about 4 in. long, terete, tapering to a slender point, glabrous. *Seeds*  $\frac{1}{2}$  in. long, ovate-oblong, flat.

In the Doab of the Upper Gangetic Plain near Allahabad (Hb. Kew) also in Bundelkhand (Edgeworth), growing on waste land and amongst bushes. Flowers during the hot season. **DISTRIB.** : Punjab Plain and southwards to Travancore. Roxburgh states that every part of the plant is eaten by the natives, either raw or stewed in their curries, the fresh roots tasting like a raw turnip, and the leaves and stem like purslane.

Many of the *Asclepiadaceæ* are extremely ornamental. The following belonging to genera which are not represented in the indigenous flora of the Upper Gangetic Plain should be specially mentioned as being often met with in gardens within the area of this flora. *Cryptostegia grandiflora*, R. Br. (Tribe Periplocæ), a large climbing shrub with glossy foliage and handsome rose-coloured flowers. It is believed to be

a native of Madagascar. See Watt E. D. regarding the caustichous formed from its abundant milky juice—*Asclepias curassavica*, L. (Tribo Cynanchææ, an erect perennial herb with linear-lanceolate leaves and handsome orange coloured flowers. It is a native of the W. Indies and has been introduced into India and other tropical countries, often occurring as a weed. An account of its medicinal properties will be found in Watt's Economic Dictionary—*Stephanotis floribunda*, Brongn. (Tribo Maradeniææ), a climbing shrub with thick smooth leaves and large clusters of very fragrant pure white wax-like flowers. It is a native of Madagascar and is sometimes known as Madagascar Jasmine.

### LXXIII.—LOGANIACEÆ.

Trees, shrubs or herbs. *Leaves* opposite (rarely ternate), undivided; stipules various or reduced to a raised transverse line. *Inflorescence* various. *Flowers* usually regular and bisexual, generally in 2-3-chotomous cymes, the cymes sometimes subcapitate or reduced to solitary flowers; *Calyx* inferior, small, 4-5-lobed. *Corolla* 4-5-lobed or partite, lobes imbricate or valvate. *Stamens* 4-5, inserted on the corolla tube, alternate with the lobes, anthers 2-celled. *Ovary* free, usually 2-celled, styles 1 or 2, ovules one or more in each cell. *Fruit* capsular or indehiscent, 1-many-seeded. *Seeds* various, albuminous, embryo straight.—Species about 400, mostly in tropical and sub-tropical regions.

Annual, corolla valvate, fruit a capsule. 1. MITREOLA.

Shrubs or trees:—

Corolla imbricate, fruit a capsule . . . 2. BUDDLEIA.

Corolla valvate, fruit a berry . . . 3. STRYCHNOS.

#### 1. MITREOLA, Linn.; Fl. Brit. Ind. iv, 79.

Herbs. *Leaves* opposite, membranous; stipules small or reduced to a transverse ridge. *Flowers* small, white, in terminal or axillary 2-3-chotomous cymes, often unilateral on the ultimate branches. *Calyx-lobes* lanceolate. *Corolla* ureolate; lobes 5, short, valvate. *Stamens* 5, included. *Ovary* 2-celled; styles 2, short, connate under a small hairy stigma, diverging after flowering; ovules many in each cell, placentas peltate. *Capsule* obovoid, compressed at right angles to the septum, carpels dehiscing along the inner face after separation. *Seeds* many, minute, globose or elongate, albumen fleshy, embryo linear.—Species 4, two American and two Asiatic.

*M. oldenlandioides*, Wall. Cat. 4350; F. B. I. iv, 79; Cooke Fl. Bomb. ii, 181; Prain Beng. Pl. 702.

- An annual, 6-8 in. high. *Leaves* membranous, glabrous or nearly so, 1-3 in. long, ovate or ovate-oblong, narrowed at both ends, petiole  $\frac{1}{2}$  in. long, stipules connate in a transverse ridge. *Flowers* in terminal and axillary dichotomous cymes, unilateral along the branches, very shortly pedicelled; bracts linear-lanceolate, shorter than the calyx. *Calyx*  $\frac{1}{2}$  in. long, divided more than  $\frac{1}{2}$  way down; lobes subacute, denticulate. *Corolla*  $\frac{1}{2}$  in. long; lobes half as long as the tube, acute, pilose towards the base inside. *Capsule* wedge-shaped, 2-horned, about  $\frac{1}{2}$  in. long. *Seeds* elongate, trigonous, shining.

Dehra Dun (Gamble). Flowers Sep-Dec. DISTRIB.: Kumaon up to 4,000 ft. and eastwards to the Sikkim Terai and on Khasia and Naga Hills, also in Chota Nagpur and southwards from Bombay and the Cent. Prov. to S. India; extending to Burma, China, Malaya and N. Australia.

## I 2. BUDDLEIA, Linn.; Fl. Brit. Ind. iv, 81.

Trees, shrubs or herbs. *Leaves* opposite, entire or toothed, united by a raised stipular line. *Cymes* dense, globose or corymbiform, axillary or arranged in a thyrsoid terminal panicle. *Calyx* campanulate, 4-lobed. *Corolla-tube* cylindric or urn-shaped; lobes 4, short, spreading, imbricate in bud. *Stamens* 4, on the corolla-tube; anthers subsessile, ovate or oblong, cordate or 2-lobed at the base. *Ovary* 2-celled; style linear, stigma clavate or capitate; ovules many in each cell. *Capsule* septiciidally 2-valved. *Seeds* many, oblong or fusiform, testa appressed or loosely reticulate, often expanded into a wing or tail, albumen fleshy, embryo straight.—Species about 70, in tropical and subtropical Asia and Africa, also in tropical America.

*B. asiatica*, Lour. Fl. Cochinch. 72; Royle Ill. 291; F. B. I. iv, 82; Watt E. D.; Brandis For. Fl. 313; Ind. Trees 475; Collett Fl. Siml. 322; Kanjilal For. Fl. 247; Gamble Man. Ind. Timb. 495; Prain Beng. Pl. 703. *B. Neemda*, Buch.-Ham.; Roxb. Fl. Ind. i. 399; Royle Ill. 291. *B. subserrata*, Don. Prod. 92.—Vern. *Neemda*, *dudhia* (Dehra Dun).

A large evergreen shrub with thin gray bark, extremities and young branches softly tomentose. *Leaves* 2½-6 in. long, lanceolate acute or acuminate and usually acute at the base, crenate or serrulate or the upper ones usually entire, glabrous above, clothed beneath with white or yellowish tomentum, petioles 0-½ in. long. *Flowers* white, scented, subsessile, in dense slender bracteate tomentose terminal or axillary



minute bracts near the base. *Calyx* deeply 5-lobed; lobes lanceolate, acute, reaching to the rounded sinuses of the corolla, pubescent. *Corolla* dark purplish-brown, deeply 5-lobed; lobes lanceolate, subobtusely, puberulous, margins recurved. Inner corona of five incumbent oblong emarginate scales. *Follicles* not seen.

Found by Duthie's collector at Chakia in the Bahraich district of N. Oudh. Flowers in April. Its affinity appears to be with *B. parviflorum* Hk f., from which it differs in the broader leaves, the shorter pedicels and in the size and colour of the flowers. From *B. lævigatum* it may be distinguished by its conspicuous foliage and by its solitary erect and much larger flowers. A single specimen only was found, and the material was insufficient for a complete description of the corona.

#### 17. ORTHANTHERA, Wight., Fl. Brit. Ind. iv, 64.

An erect virgate leafless shrub. *Flowers* small, crowded in dense peduncled woolly cymes. *Calyx-lobes* lanceolate, eglandular. *Corolla* salver-shaped; tube ovoid, equalling the lanceolate valvate lobes. *Corona* of 5 small erect scales inserted in the sinuses of the corolla lobes, sometimes with an inconspicuous fleshy ring below the anthers. *Staminal column* ovoid, anther-tips without appendages pollen-masses globose, stipitate, erect. *Stigma* included, flat, 5-gonal. *Follicles* elongate, cylindric, opening out flat after dehiscence. *Seeds* comose. A single species confined to N. India.

*P. viminea*, W. & A. in Wight Contrib. 43; Royle Ill. 274, t. 66, f. 1; Dene in Jacquem. Bot. Voy. 109, t. 115; Brandis For. Fl. 335; Ind. Trees 472; F. B. I. iv, 64; Watt E. D.; Kanjilal For. Fl. 245; Gamble Man. Ind. Timb. 493. Vern. Mahur-ghas (Hind), Chapkia (Bijnor), Khip (Delhi).

A small erect leafless shrub with stiff glabrous branches about as thick as a crow's quill. *Flowers* dull-brown, arranged in compact woolly cymes; peduncles  $\frac{1}{2}$ -1 in. long, pedicels very short. *Sepals* linear-lanceolate, nearly as long as the corolla. *Corolla* salver shaped,  $\frac{1}{2}$  in. long, villous outside, tube ovoid; lobes erect, oblong, as long as the tube, keeled and glabrous within. *Follicles* solitary, erect, 4-6 in. long, linear, compressed; pericarp thin, brown within. *Seeds*  $\frac{1}{3}$  in. long, coma  $\frac{1}{2}$  in. long.

Common in the stream-beds of the Siwalik range, and on the banks of rivers in Dehra Dun, also in the Bijnor forests and eastwards to the Gonda district of N. Oudh, and westwards to Delhi and Merwara. Flowers during March and April. **DISTRIB.**: Himalaya up to 2,500 ft. from Kumaon to Peshawar, Punjab, Sind and Rajputana. The fibre of the stem is often made into ropes, and in Oudh the flower-buds are eaten as a vegetable.

ripe. *Seeds* many,  $\frac{1}{2}$ – $\frac{3}{4}$  in. in diam., flat, grey, shining, clothed on both sides with fine silky hairs radiating from the centre.

Gorakhpur forests (Brandis, Duthie). **DISTRIB.** From Bengal and Bombay to S. India, extending to the drier region of Ceylon; also in deciduous forests throughout Burma. *Flowers* February–April. The tree is leafless for a short time during the hot season. Almost every part of this tree is more or less poisonous, but especially the seeds, which yield the alkaloids known as strychnine and brucine. The pulp of the fruit, although containing strychnine, is largely eaten by certain birds, as well as by monkeys and other animals. The wood is extremely bitter, and is sometimes used as a remedy for intermittent fever. As a timber it is chiefly useful for fancy cabinet, work and agricultural implements.

**2. *S. potatorum*, Linn. f. Suppl. 148; Roxb. Fl. Ind. i, 576.; Royle III 272; Brandis For. Fl. 317; Ind. Trees 474; F. B. I. iv 50; Watt E. D.; Gamble Man. Ind. Timb. 498; Prain Beng. Pl. 704; Cooke Fl. Bomb. ii, 186.—Vern. Nirmali.** (The Clearing-nut tree.)

A medium-sized glabrous tree, 40–50 ft. high. *Trunk* often irregularly fluted. *Bark* blackish, deeply furrowed. *Leaves* nearly sessile, 2–3 in. long, ovate or elliptic, acute or rounded at the base, the apex acute or acuminate, subcoriaceous, glabrous and shining, spuriously 3- or 5-nerved. *Flowers* white, fragrant, in short axillary cymes, pedicels very short. *Calyx*  $\frac{1}{2}$  in. long; lobes 5, ovate, acute. *Corolla*  $\frac{1}{2}$ – $\frac{1}{4}$  in. long; lobes 5, oblong, acute, hairy inside at their bases. *Ovary* ovoid, glabrous, tapering into the slender style, stigma slightly 2-lobed. *Berry* about  $\frac{2}{3}$  in. in diam., black when ripe. *Seeds* 1 or 2, circular,  $\frac{1}{2}$  in. in diam., bluntly lenticular, slightly compressed, clothed on both sides with short silvery adpressed hairs.

Bundelkhand forests (Edgeworth, Duthie). **DISTRIB.** Bengal, Cent. and S. India to Ceylon, also in Burma. *Flowers* during April and May. This tree, unlike the preceding, is not poisonous. The pulp of the fruit is eaten by the natives; and the seeds, known as 'clearing-nuts,' are much used for cleansing muddy water, the albumen acting as a precipitant of the suspended impurities. The seeds are also made use of in diseases of the eye. The wood is said to be good for ploughs, building purposes, etc.

## XXIV.—GENTIANACEÆ.

Herbs, usually glabrous and bitter, rarely shrubs. *Leaves* opposite, rarely alternate, entire (often sinuate in *Limnanthemum*), exstipulate. *Flowers* usually regular (except in *Canscora* and *Hoppea*), arranged in terminal spicate or fascicled cymes, or axillary and

clustered, or solitary, rarely bracteate. *Calyx* inferior, persistent, 4-7-lobed or -partite; lobes usually imbricate in bud. *Corolla-tube* campanulate, funnel-shaped or cylindric; lobes 4-7, twisted to the right or (in *Limnanthemum*) induplicate-valvate. *Stamens* 4-7, on the throat or tube of corolla, alternate with its lobes, unequal or more or less suppressed in *Canscora* and *Hoppea*; filaments linear or sometimes dilated below; anthers opening longitudinally, rarely by apical pores. *Disk* annular or of 5 glands or none. *Ovary* of 2 carpels, 1-2-celled; style simple, stigma entire or 2-lobed; ovules usually numerous. *Fruit* usually a capsule, membranous, dehiscing septicidally by two valves, rarely fleshy. *Seeds* many, small, sometimes winged, albuminous. —Species 5-600, chiefly in temperate or in mountainous regions of both hemispheres.

Terrestrial herbs, leaves opposite, cor.-lobes contorted in bud.

Ovary 2-celled . . . . . 1. EXACUM.

Ovary 1-celled.

Cor.-lobes eglandular at the base.

Cor. regular.

Style linear.

Flowers white, in sessile axillary clusters . . . . . 2. ENICOSTEMA.

Flowers pink or white, in dichotomous cymes . . . . . 3. ERYTHRÆA.

Style short or none, flowers usually blue . . . . . 4. GENTIANA.

Cor. irregular.

Flowers yellow, stigma subentire . . . . . 5. HOPPEA.

Flowers pink or white, stigma deeply 2-lobed . . . . . 6. CANSOCRA.

Cor. with one or two glandular nectaries at the base of each lobe . . . . . 7. SWERTIA.

Aquatic herbs, leaves alternate, cor.-lobes induplicate-valvate in bud . . . . . 8. LIMNANTHEMUM.

# 1. EXACUM, Linn.; Fl. Brit. Ind. iv, 95.

Annual herbs with quadrangular and usually branching stems. *Leaves* opposite, entire. *Flowers* showy, in terminal and axillary usually dichotomous cymes. *Calyx* deeply 4-5-lobed; lobes keeled, winged or flat. *Corolla* rotate, blue, purple or white, usually persis-

tent in fruit; tube short, globose; lobes 4-5, ovate or oblong. *Stamens* 5-4, on the throat of the corolla; filaments short, dilated at the base; anthers exserted, opening by terminal pores which usually extend into lateral slits. *Ovary* 2-celled; style long, curved; stigma small, subcapitate, ovules many. *Capsule* globose. *Seeds* reticulate.—Species 20, mostly Indian, a few extending to Malaya, China and Africa.

Stems stout, up to 4 feet, leaves 5-nerved . 1. *E. tetragonum*.

Stems slender, up to 1 foot, leaves 3-nerved . 2. *E. pedunculatum*.

1. *E. tetragonum*, Roxb. Hort. Beng. 10; Fl. Ind. i, 398; Don. Prod. 128; Trans. Linn. Soc. xvii, 531; Royle Ill. 276; F. B. I. iv 95; Watt E. D.; C. B. Clarke in Journ. Linn. Soc. xiv, 424; Prain Beng. Pl. 706; Collett. Fl. Siml. 323; E. roseum, Royle Ill. 276.—Vern. Uda chiretta.

Stems erect, stout, 1-4 ft. high, 4 angled. Leaves sessile, about 5 in. long, lanceolate, acute, usually 5 nerved. Flowers azure-blue,  $1\frac{1}{4}$  in. in diam., usually 4-merous, arranged in many-flowered terminal panicles. Calyxlobes  $\frac{1}{4}$  in. long, ovate, acuminate, keeled but hardly winged. Corollalobes  $\frac{1}{2}$  in. long, broadly elliptic, acute. Style  $\frac{1}{2}$  in. long. Capsule subglobose,  $\frac{1}{3}$  in. long.

Fairly abundant within the area in damp ground, especially in Bundelkhand and in the Sub-Himalayan tracts from Dehra Dun eastwards. DISTRIB. Himalaya from Simla to Bhutan ascending to 5,000 ft., and from Bengal and Chota Nagpur to the Central Provinces; also on the Khasia Hills, extending to Burma, China, the Malay Peninsula, Borneo and the Philippines. The plant is used medicinally as a substitute for chiretta.

2. *E. pedunculatum*, Linn. Sp. Pl. 112; Clarke in Journ. Linn. Soc. xiv, 427; F. B. I. iv, 97; Watt E. D.; Prain Beng. Pl. 706; Cooke Fl. Bomb. ii, 188. *E. sulcatum*, Roxb. Fl. Ind. i, 400.

Stems erect, slender, 3-18 in. high, 4-angled, much branched above. Leaves subsessile,  $1\frac{1}{4}$ -2 in. long, elliptic or lanceolate, tapering to the base, glabrous, usually 3 nerved. Flowers many, in terminal much branched panicles cymes, 4-merous, blue; peduncles and pedicels long, rigid, lower bracts leaf like. Calyx  $\frac{1}{4}$  in. long; lobes ovate, acuminate, distinctly winged on the back. Corolla  $\frac{1}{2}$  in. long, lobes lanceolate, acute. Capsule globose,  $\frac{1}{3}$  in. in diam., smooth and shining.

Plentiful in Bundelkhand and along the base of the Himalaya from Dehra Dun eastwards. Flowers in December. DISTRIB. Throughout the greater portion of India and in Ceylon, ascending to 6,000 ft. on the Himalaya; it is found also in Burma and in the Malay Peninsula. This plant possesses the tonic properties of chiretta and gentian, and is much used by the natives for fever.

## 2. ENICOSTEMA, Blume; Fl. Brit. Ind. iv, 100.

Erect or decumbent branching herbs. *Leaves* opposite, sessile. *Flowers* small, in sessile axillary clusters. *Calyx-tube* campanulate; lobes 5, lanceolate. *Corolla* tubular below, narrow funnel-shaped above; lobes 5, small. *Stamens* 5, attached to the corolla-tube; filaments linear, with a small double-hooded scale on the inner side of each at the base; anthers erect, not twisted, acute. *Ovary* 1-celled, placentas slightly intruded; style short, stigma capitate, ovules many. *Capsule* ellipsoid. *Seeds* many, subglobose, foveolate.—Species 4, two in Trop. Africa one of which occurs also in India, one in Madagascar and one in Trop. America.

*E. littorale*, Blume Bijdr. 848; F. B. I. iv, 101; Watt. E. D.; Cooke Fl. Bomb. ii, 159. *Gentiana verticillata*, Linn.; Roxb. Fl. Ind. ii, 71 *Slovotia verticillata*, D. Don in Trans. Linn. Soc. xvii, 532.—Vern. *Chota chiretta*.

A glabrous perennial herb, 4-20 in. high, branching from the base. *Stems* erect or procumbent, usually 4-angled. *Leaves* sessile, decussate, 1-2½ in. long, varying in shape from linear to elliptic-lanceolate, 3-nerved, the two marginal ones often obscure. *Flowers* in whorled clusters, white. *Calyx* ½ in. long; lobes as long as the tube, obtuse, with narrow membranous margins. *Corolla* tubular, 1½ in. long; lobes ½ in., elliptic, acute. *Anthers* included. *Stigma* large, 2-lobed. *Capsule* ½-¾ in. long, narrowed towards the base.

Common in wet places. Flowers during the rainy season. *DISTRIB.* Throughout the greater part of India especially near the sea, but apparently not in Bengal. It occurs in Ceylon and extends to Java, Trop. and S. Africa and the W. Indies. The plant is used as a bitter tonic, especially in W. and S. India.

## 3. ERYTHRÆA, Renealm; Fl. Brit. Ind. iv, 101.

Herbs, annual or perennial, erect, branching. *Leaves* opposite, sessile or amplexicaul. *Flowers* (in the Indian species) pink or white, arranged in dichotomous often corymbose cymes. *Calyx* tubular, 5 or 4-fid., lobes keeled. *Corolla-tube* long or short; lobes 5 or 4, spreading. *Stamens* 5 or 4, inserted near the summit of the corolla-tube; filaments short, linear; anthers narrowly oblong, usually exerted, often spirally twisted. *Ovary* 1-celled placentas much intruded, style linear, stigma 2-lobed. *Capsule* oblong, about as long as the calyx, nearly 2-celled, many seeded. *Seeds* very small, foveolate.—Species about 30, chiefly in temperate and sub-

tropical regions of the N. Hemisphere, extending to Chili and Australia.

Bracts conspicuous; calyx-teeth about  
equalling the corolla tube . . . . 1. *E. ramosissima*.

Bracts not conspicuous; calyx teeth much  
shorter than the corolla tube . . . . 2. *E. Roxburghii*.

1. *E. ramosissima*, Pers. Syn. i, 283; F. B. I. iv, 101.

*Stems* 3-15 in. high, very leafy. *Leaves*  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long, ovate, elliptic or lanceolate, obtuse or acute, the lowermost not in rosettes. *Flowers* in conspicuously bracteate clusters, sessile, pink. *Calyx-teeth* linear, about equalling the corolla tube, substellate in bud.

Moradabad and Saharanpur districts. *DISTRIB.* Punjab Plain, Afghanistan and Baluchistan extending to Egypt, also in China and Manchuria.

2. *E. Roxburghii*, G. Don Gen. Syst. iv, 206; Royle III. 277; F. B. I. iv, 102; Watt E. D.; Prain Beng. Pl. 707; Cooke Fl. Bomb. ii, 190. *E. ramosissima* (vars. A. and B.) Clarke in Journ. Linn. Soc. art, 428 (no. of Poir.) *Chironia centauroides*, Roeb. Fl. Ind. i, 584.

3. Small erect annual. *Stems* 2-12 in. high, 4 angled. *Radical leaves* in rosettes,  $\frac{3}{4}$  1 in. long, obovate or oblong, obtuse; *cauline* smaller, linear-oblong. *Flowers* pink, in dichotomous cymes, with a long pedicelled flower in each fork, bracts not prominent. *Calyx teeth* linear, acute, much shorter than the corolla tube, substellate in bud. *Corolla* rotate,  $\frac{3}{4}$   $\frac{1}{2}$  in. long; lobes elliptic, acute. *Anthers* at length spirally twisted. *Stigma* large, 2-lamellate. *Capsule* narrowly oblong.

Abundant within the area, especially in cultivated land. *Flowers* Feb.—April. *DISTRIB.* From the Punjab Plain and Bengal to S. India. The plant is used as a substitute for *chiretta*, especially in Bengal.

4. *GENTIANA*, Linn.; Fl. Brit. Ind. iv, 108.

Herbs, annual or perennial, sometimes woody below. *Leaves* opposite, often connate at the base. *Flowers* blue, yellow or white, axillary and terminal, usually sessile. *Calyx* tubular, terete or rarely, ceeled, sometimes spathaceous, lobes 5 or 4. *Corolla* tubular, campanulate funnel-shaped or subrotate; lobes 5 or 4, often with folds between the lobes. *Stamens* 5 or 4, attached at or below the middle of the tube, included; filaments linear, somewhat flattened downwards. *Ovary* 1-celled, placentas slightly intruded, style usually short or one, stigmas divergent. *Capsule* stalked or sessile. *Seeds* many, small, reticulated.—Species about 300, chiefly inhabiting mountain-

ous parts of the Old World, a few occurring on the Andes and in New Zealand and Australia. Forty species are described in the Flora of British India, the majority of which are Himalayan.

Leaves green, calyx-lobes broad . . . 1. *G. pedicellata*.

Leaves silvery, shining; calyx-lobes narrow, pointed . . . 2. *G. aprica*.

1. *G. pedicellata*, Wall. Cat. 9394; Clarke in Journ. Linn. Soc. xiv, 435. *G. quadrifaria*, Clarke in F. B. I. iv, 111 (not of Blume); Collett Fl. Siml. 324. *Ericula pedicellata*, D. Don in Trans. Linn. Soc. xvii, 514.

Whole plant 2½-5 in. high. Stems many, slender, much branched, usually procumbent. Leaves dark green, not margined; radical rosulate, spreading, lanceolate, acuminate, narrowed to the base, 3-nerved; cauline smaller, spreading or recurved, mucronate. Flowers in terminal cymes, ½ in. long, blue or greenish-yellow. Calyx about half as long as the corolla, lanceolate, acute, rigid, often subsquarrose. Corolla 5-lobed; lobes ovate, acuminate. Capsule stipitate, narrowed to the base.

Dehra Dun and on both sides of the Siwalik range up to 3,000 ft. Flowers in March. DISTRIB. Himalaya from Kashmir to Bhutan up to 10,000 ft., also on the Khasia Hills, the Deccan Mts. and those of Ceylon, extending to Burma, Java and probably to China.

2. *G. aprica*, Don. in Jacquem. Voy. Bot. 112, t. 113; Collett Fl. Siml. 324. *G. decemfida*, var. *aprica*, Clarke in F. B. I. iv, 112. *Ericula decemfida*, D. Don in Trans. Linn. Soc. xvii, 514; Royle Ill. 277.

A glabrous erect annual. Stems stiff, 3-10 in. high, simple or with many ascending branches. Leaves silvery, shining, radical rosulate, ½-¾ in. long, broadly ovate, mucronate, 3-nerved, glaucous beneath; cauline ½ in. long, narrowly lanceolate, aristate, conduplicate, connate at the base; uppermost smaller, subulate. Flowers blue, subpaniculate, pedicels often ½ in. long. Calyx 3-fid., about half as long as the corolla; lobes narrow, finely pointed. Corolla-lobes lanceolate, acuminate. Capsule ½ in. long, obovate or cuneate, stipitate, usually included, valves with pale-coloured edges.

Abundant on rocks and grassy banks throughout the Siwalik range, also in Dehra Dun. Flowers in March and April. DISTRIB. Himalaya from below Simla to Kumaon up to 3,000 ft.; also in Upper Burma.

### 5. HOPPEA, Willd.; Fl. Brit. Ind. iv, 100.

Small, much branched, glabrous herbs. Leaves small, opposite, sessile. Flowers sessile or shortly pedicelled, in 2-3-ohotomous cymes. Calyx campanulate; lobes 4, ovate, acuminate. Corolla urceolate

or tubular, shorter than the calyx; lobes 4, more or less unequal. *Stamens* 1 perfect and 3 sterile, attached to the throat of the corolla; filaments short, linear; anthers small, ovate, dehiscing introrsely by longitudinal slits, those of the barren stamens small or none. *Ovary* 1-celled, placentas not far intruded; style short, stigma subentire. *Capsule* globose or ellipsoid. *Seeds* nearly black, obscurely reticulate. —Species 2, both in India.

*H. dichotoma*, Willd. in *Ges. Naturf. Fr. Neue Schr.* iii, 434; *F.B.I.* iv, 100; *Cooke Fl. Bomb.* ii, 190; *Prain Beng. Pl.* 707. *Pladera pusilla*, Roxb. *Fl. Ind.* i, 403; *Clarke in Journ. Linn. Soc.* xiv, 429; *Don in Trans. Linn. Soc.* xvii, 530.

A small glabrous annual, 2-5 in. high, copiously branching from near the base. Stems and branches 4-angled and more or less winged. *Leaves* about  $\frac{1}{4}$  in. long, ovate, acute. *Bracts* lanceolate. *Calyx*  $\frac{1}{16}$ – $\frac{1}{8}$  in. long; lobes scarious, longer than the corolla, ovate, acuminate, with a prominent green nerve along the margin. *Corolla*  $\frac{1}{2}$  in. long, white or pale-yellow, ventricose in fruit; lobes half as long as the tube, triangular, recurved. *Capsule* ellipsoid,  $\frac{1}{2}$  in. long.

Abundant, especially in damp ground. Flowers during September and October. **DISTRIB.** Common on the Punjab Plain, and in Bengal, Bombay, Central and S. India; also in Lower Burma, extending to the Philippines.

#### 6. CANSCORA, Lamk.; *Fl. Brit. Ind.* iv, 102.

Erect annuals, much branched. *Leaves* opposite, sessile, petioled or connate below. *Flowers* pink or white, in lax terminal cymes. *Calyx* tubular, 4-toothed, tube terete ribbed or winged. *Corolla-tube* cylindric; lobes 4, more or less unsymmetric, imbricate in bud. *Stamens* 4, near the summit of the corolla-tube, 1 or 2 fertile with longer filaments and larger anthers, the others with short filaments and barren. *Ovary* 1-celled, placentas not far intruded, style linear, stigma deeply 2-lobed, ovules many. *Capsule* cylindric, membranous. *Seeds* very small, dark brown, reticulate.—Species 14, in India, Malaya, Australia and Trop. Africa.

Flowers rose-coloured, calyx not winged . . . 1. *C. diffusa*.

Flowers white, calyx winged . . . . . 2. *C. decussata*.

1. *C. diffusa*, R. Br. *Prod.* 451 in *Obs.*; *Clarks in Journ. Linn. Soc.* xvi, 429; *F. B. I.* iv, 103; *Watt E. D.*; *Prain Beng. Pl.* 708; *Cooke Fl. Bomb.* ii, 191. *Pladera virgata*, Roxb. *Fl. Ind.* i, 401.

A slender, much branched annual, 2 ft. or more in height. *Stems* obtusely 4-angled. *Leaves* membranous, 3-nerved, 1 in. long, the lower lanceolate-



or elliptic and often petioled; upper sessile, broadly ovate, acute or apiculate, rounded at the base, uppermost leaves much smaller. *Flowers* pink, in lax diffuse panicles, pedicels filiform, the ultimate bracts very minute. *Calyx*  $\frac{1}{2}$  in. long, not winged; teeth lanceolate, acute. *Corolla* in. long; tube  $\frac{1}{2}$  in., green; lobes unequal, obtuse. *Stamens* 4, one of which is fertile and larger than the others and inserted higher up. *Capsule* narrowly oblong, nearly as long as the calyx, membranous.

Abundant within the area in wet places, especially in Merwara, Bundelkhand, Dehra Dun, Rohilkhand and N. Oudh. *Flowers* during the rainy season. *DISTRIB.* Throughout India up to 2,000 ft. in Kumaon, also in Ceylon and Burma, extending to Malaya, E. Trop. Africa, Australia and the Philippines. The plant is used medicinally as a substitute for *C. decussata*.

2. *C. decussata*, Ram. & Sch. Syst. iii, Mant. 229; F. B. I. iv, 104; Collett Fl. Siml. 323; Frain Beng. Pl. 708. *Pladerna decussata*, Roxb. Fl. Ind. i, 402.

An erect branching annual, up to 2 ft. in height. *Stems* 4-winged, branches decussate. *Leaves* 1-1 $\frac{1}{2}$  in. long, oblong, lanceolate, acute, 3-nerved. *Cymes* lax, the branches erect, rigid, 4-winged. *Flowers* white, those in the forks long-pedicelled. *Calyx*  $\frac{3}{4}$ - $\frac{1}{2}$  in. long, 4-winged. *Corolla-tube* as long as calyx; lobes  $\frac{1}{2}$  in. long, obovate. *Stamens* as in preceding. *Capsule* and seeds rather large.

Bundelkhand, Siwalik Range, Dehra Dun and N. Oudh. *Flowers* August and September. *DISTRIB.* Himalaya ascending to 5,000 ft., and throughout India extending to Ceylon, Burma and Trop. Africa. The plant is much valued as a tonic in nervous complaint.

## 7. SWERTIA, Linn. Fl. Brit. Ind. iv, 121.

Annual or perennial herbs. *Leaves* usually opposite. *Flowers* in terminal corymbose or paniced cymes, blue, lurid or white, sometimes with yellow glands. *Calyx* 4-5 partite, tube none or very short; lobes 4-5, acute or obtuse. *Corolla* subrotate, tube very short; lobes 4-5, acute or obtuse, each with one or a pair of glandular nectaries at the base. *Stamens* 4-5, attached near the base of the corolla, free; filaments linear, often more or less dilated downwards; anthers oblong, versatile. *Ovary* 1-celled, placentas slightly intruded; style short or none, stigma 2-lobed, ovules many. *Capsule* ovate or oblong, 2-valved. *Seeds* usually many, minute, compressed, often winged, reticulate.—Species about 90, chiefly Asiatic, a few in Europe, S. Africa, Madagascar and America.

8. *angustifolia*, Buch.-Ham. \* ex. D. Don Prod. Fl. Nep. 127; Clarke in

\* For a more detailed account of this species and its allies see Mr. J. H. Burkill's recently published paper in Journ. As. Soc., Beng. (New Series), Vol. II, No 8.

*F. B. I.* iv, 125; *Watt E. D.*; *Collett Fl. Siml.* 327; *Burkill in Journ. As. Soc. Beng.* ii, No. 8 (1906, 373. *S. elegans*, *Wall. Cat.* 4376. *S. pulchella*, *Buch.-Ham. l. c.* (*nomen nudum*); *Wall. Cat.* 4375. *Clarke in F. B. I.* l. c.; *in Journ. Linn. Soc.* xxv, 48. *S. affinis*, *Clarke in F. B. I.* iv, 126. *Ophelia angustifolia*, *D. Don. in Trans. Linn. Soc.*, xvii, 524. *O. porrigens*, *D. Don. ex G. Don. Gen. Syst.* iv, 178. *O. pulchella*, *D. Don in Trans. Linn. Soc.* xvii, 524. *O. pretensis*, *Edgew. in Trans. Linn.* xx, 86. *O. affinis*, *W. & A. O. elegans*, *Wight*.

Stems erect, 1-3 ft., much 3-chotomously branched, 4 gonous, the angles narrowly winged. *Leaves* 2-2½ in. long, narrowly lanceolate, acute, 1-3 nerved. *Flowers* white or bluish, 4-merous. *Calyx* 4-partite; segments lanceolate or oblong linear, acute, often much longer than the corolla. *Corolla-tube* oblong or ovate-lanceolate, acute, often veined with blue and marked with blue or black dots; each lobe with a solitary impressed circular gland near the base, naked or partially closed by a small scale.

**VAR. 1. *Hamiltoniana***, *Burkill*.—Sepals equalling or slightly longer than the corolla.—Dehra Dun (Duthie). **DISTRIB.** Himalaya, westwards to Hazara and eastwards to Sikkim, up to 6,000 ft., extending to Assam and China.

**VAR. 2. *pulchella***, *Burkill*.—*S. pulchella*, *Buch.-Ham.* *S. affinis*, *Clarke in F. B. I.* iv, 126. *Ophelia porrigens* *G. Don.*—Sepals shorter than the corolla. Corolla lobes erect and connivent in young fruit. Plant about 1-ft. high.—Dehra Dun (Gamble); Siwalik range in the Mohand Pass (Royle), Sub-Siwalik tract (Edgeworth).—**DISTRIB.** Himalayas, westwards to Dalhousie, up to 10,000 ft. and eastwards to Sikkim; also on the Khasi-Naga Hills, Chota-Nagpur, the Central Provinces and southwards along the E. Ghats to S. India, extending to C. and Upper Burma, the Shan States and China.

**VAR. 3. *elegans***, *Clarke*. *S. elegans*, *Wall.*—Corolla-lobes somewhat spreading in young fruit. Plant dwarf.—Oudh, Terai, in shisham forest (Wallich); forests in the Kheri district of N. Oudh (T. Thomson and Duthie).

*S. angustifolia* and its varieties all possess more or less the bitter properties of the true *Chiretta* (*S. Chirata*, *Buch.-Ham.* a species widely distributed on the Himalaya), they are not, however, extensively made use of medicinally except where *S. Chirata* is unobtainable.

**S. LIMNANTHEMUM**, *S. P. Gmel.*; *Fl. Brit. Ind.* iv, 181.

Aquatic herbs. floating or creeping. Stems erect or runner-like, or resembling petioles. *Leaves* orbicular, elliptic or ovate, deeply cordate or peltate, entire or obscurely sinuate. *Peduncles* clustered at the nodes; flowers white or yellow, dimorphic, solitary or in pairs

or clusters at the nodes, or on the apparent petiole close below the leaf-blade. *Calyx* 4-7-partite, lobes lanceolate or oblong. *Corolla* subrotate, 4-7-partite; lobes induplicate-valvate in bud, usually hairy or with a median crest, margins fimbriate or naked. *Stamens* 4-7, on the corolla-tube, filaments short, anthers versatile. *Ovary* 1-celled, placentas not intruded, style long or short, stigma 2-lobed. *Capsule* indehiscent or bursting irregularly. *Seeds* winged or not, smooth or tuberculate.—Species about 20, in tropical or temperate regions of the world.

Corolla-lobes glabrous, with a longitudinal crest down the middle, seeds smooth . . . 1. *L. cristatum*.

Corolla-lobes densely papillose, not crested down the middle, seeds scabrous . . . 2. *L. indicum*.

1. *L. cristatum*, *Gris b. in DC. Prod. ix, 139*; *F. B. I. iv, 131*; *Watt E. D.; Prain Beng. Pl. 709*; *Cooke Fl. Bomb. ii, 195*. *Menyanthes cristata* *Roxb.*; *Fl. Ind. i, 459*. *Villarsia cristata*, *Spreng.*; *Royle Ill., 277*.—Vern. Chuli.

A smaller plant than *L. indicum*, and with shorter and more slender etiole-like branches. *Rhizome* short, erect. *Floating leaves* 2-4 in. in diam., purplish and with green veins beneath; petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. *Flowers* white, pedicels  $\frac{3}{4}$ -2, in. long. *Calyx-lobes* obtuse. *Corolla*  $\frac{3}{4}$  in. in diam.; lobes  $\frac{1}{2}$  in. long, obovate, glabrous, with a broad longitudinal crest down the middle of each. *Capsule*  $\frac{1}{2}$  in. long. *Seeds* strongly muriculate.

Very common within the area in ponds and ditches, flowering throughout the summer months. *DISTRIB.* Throughout India and in Ceylon, extending to China, Malaya and the Philippines. The stems, leaves and fruits are often eaten in certain parts of India more particularly in times of famine.

2. *L. indicum*, *Thwaites Enum. 205*; *F. B. I. iv, 131*; *Prain Beng. Pl. 709*; *Cooke Fl. Bomb. ii, 195*. *Menyanthes indica*, *Linn.*; *Roxb. Fl. Ind. i, 460*. *Villarsia indica*, *Vent.*; *Royle Ill., 277*.—Vern. Bara chuli.

*Rhizome* horizontal or oblique; branches from the axils of sheathing membranous scales, petiole-like, each on reaching the surface of the water producing from a swollen node near the apex a tuft of roots, a cluster of flowers, a single floating leaf and a branch capable of repeating the formation of other flowers and leaves. *Floating leaves* fleshy, 3-12 in. in diam., orbicular, cordate, the basal lobes obtuse, margins more or less sinuate, green beneath; petioles stout,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. *Flowers* in clusters, appearing above the surface of the water between the basal-lobes of the leaves; pedicels 2-5 in. long. *Calyx* 5-6-partite; lobes  $\frac{1}{2}$  in. long, oblong, subacute. *Corolla* 1 $\frac{1}{2}$  in. across, white with a yellow centre; lobes usually 6, oblong, obtuse,  $\frac{1}{2}$  in. long, clothed inside with long cottony hairs, but not crested down the middle. *Capsule*  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., subglobose. *Seeds* many, obovate, smooth.

Abundant in ponds within the area. Flowers April to September. **DISTRIB.** Throughout India and in Ceylon; also in Afghanistan extending to China, Malaya, Australia and to the Fiji and Mascarene Islands.

## LXXV.—HYDROPHYLLACEÆ.

Herbs, rarely shrubs. *Leaves* radical or alternate; stipules none. *Flowers* regular, bisexual, usually in unilateral or 2-chotomous cymes, sometimes spicate or in racemes. *Calyx* inferior, 5-partite. *Corolla* 5-lobed; lobes imbricate, rarely contorted. *Stamens* 5, inserted on corolla-tube and alternate with its lobes; filaments filiform, anthers versatile, introrse. *Disk* hypogynous, inconspicuous or none. *Ovary* superior, 1-2-celled; ovules usually many, styles 1 or 2. *Capsule* 2-valved or dehiscent irregularly. *Seeds* minute, albumen fleshy, embryo minute.—Species about 170, chiefly American.

### HYDROLEA, Linn.; Fl. Brit. Ind. iv, 133.

*Leaves* alternate, entire. *Flowers* blue, in short terminal racemes or cymes. *Calyx-segments* lanceolate. *Corolla* rotate or campanulate, lobes imbricate. *Stamens* inserted on the short corolla-tube, filaments usually dilated at the base, anthers sagittate. *Ovary* completely 2-celled; ovules many in each cell; styles 2, distinct. *Capsule* globose or ovoid, dehiscent septicidally or sometimes irregularly.—Species about 20, in N. and S. America and in Trop. Africa, extending to India, Malaya and Australia.

*H. zeylanica*, Vahl. *Symb. Bot.* ii, 46; *F. B. I.* iv, 133; *Watt E. D.*; *Prain Beng. Pl.* 711; *Cooke Fl. Bomb.* ii, 197; *Nama zeylanica*, L.; *Roxb. Fl. Ind.* ii, 73.

An annual usually decumbent herb. *Stems* up to 20 in. long, often rooting at the lower nodes, somewhat succulent, glabrous below, glandular pubescent upwards. *Leaves* membranous,  $\frac{1}{2}$ -2 in. long, lanceolate or oblong-lanceolate, narrowed at both ends, glabrous or somewhat pubescent, petiole very short. *Flowers* in racemes, on short lateral branches, bracts leafy. *Calyx*  $\frac{1}{4}$  in. long; lobes acute, gland pubescent, 3-nerved. *Corolla* blue with darker veins,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, deeply partite, lobes ovate. *Stamens* exserted, filaments dilated at the base, anthers sagittate and often twisted. *Capsule*  $\frac{1}{2}$  in. long, ovoid-oblong, enclosed in the enlarged persistent calyx, placentas central. *Seeds* many, minute, oblong.

Common in wet ground, and often met with in rice-fields. Flowers October—December. *DISTRIB.* Throughout India, ascending to 4,000 ft. on the Himalaya also in Ceylon and Burma, extending to the Malay Peninsula and Islands, China, the Philippines, Australia, Trop. Africa and America. The leaves are sometimes used as a poultice and are regarded as possessing antiseptic properties.

## LXXVI.—BORAGINACEÆ.

Herbs, shrubs or trees, often hispid or scabrous. *Leaves* usually alternate, exstipulate. *Inflorescence* usually a dichotomous cyme with scorpioid branches, sometimes 3-chotomously paniced, rarely solitary and axillary. *Flowers* 2-sexual and usually regular, with or without bracts. *Calyx* inferior, 5- rarely 6-8-toothed or lobed, usually persistent and often accrescent in fruit, tube sometimes very short. *Corolla* usually 5-lobed, often with scales in the throat; lobes imbricate in bud, rarely twisted. *Stamens* on the corolla-tube, as many as the lobes and alternate with them; filaments filiform, often dilated at the base. *Disk* hypogynous or obsolete. *Ovary* superior, 2-celled with 2 ovules in each cell, or 4-celled with one ovule in each cell; style terminal or gynobasic, long or short, simple or once or twice forked, ovules erect, anatropous. *Fruit* a drupe, or dividing into 2-4 nutlets. *Seeds* erect or oblique, testa membranous, albumen fleshy or none, radicle superior.—Species about 1,500, cosmopolitan.

Ovary entire or slightly 4-lobed, style terminal.

Style twice forked.—Trees . . . . . 1. *CORDIA*.

Style once forked or styles 2.

Style bifid.—Trees or shrubs . . . . . 2. *EHRETIA*.

Styles free at the base and apex, but easily separable at the middle.—A prostrate herb . . . . . 3. *COLDENIA*.

Style 1, simple.—A virgate shrub . . . . . 4. *RHABDIA*.

Style with a depressed stigmatose ring below the apex.—Herbs . . . . . 5. *HELIOTROPIMUM*.

Ovary deeply 4-lobed, style gynobasic (except in *Trichodesma*).

Anthers connivent in a cone, connectives much produced and twisted together at the apex, style subterminal.—Herbs . . . . . 6. *TRICHODESMA*.

Anthers not connivent in a cone, included, style gynobasic.—Herbs.

Nutlets attached to a convex or conical carpophore.

- Nutlets depressed, glochidiate their  
bases produced downwards . . . 7. CYNOGLOSSUM.  
Nutlets free round the base of the style,  
not depressed downwards, granular-  
scabrid, flowers blue or white . . . 8. BOTHRIOSPERMUM.  
Nutlets on a flat receptacle, flowers yellow,  
dimorphic . . . 9. ARNEBIA.

1. *Cordia*, Linn.; Fl. Brit. Ind. iv, 136.

Trees or shrubs, sometimes subscandent. *Leaves* alternate, rarely subopposite, petioled. *Flowers* in cymes, spikes or heads, polygamous (the 2-sexual flowers fewer than the males), ebracteate. *Calyx* tubular or campanulate, accrescent in fruit, tube often ribbed; teeth usually 5, short, sometimes unequal. *Corolla* funnel-shaped, salver-shaped or campanulate, white or orange; lobes 4-8, spreading or recurved. *Stamens* 4-8, filaments often hairy at the base; anthers shortly exserted, sagittate or hastate. *Ovary* 4-celled, glabrous; style terminal, long, bipartite, the branches again bipartite, stigma capitate or spathulate; ovules 1 in each cell. *Fruit* an ovoid or ellipsoid drupe with a bony 1-4-celled putamen, usually only one with a fertile seed. *Seeds* exalbuminous, cotyledons plicate.—Species about 280, all tropical.

Leaves alternate (sometimes subopposite in *C. Macleodii*) with 3-5 nerves from near the base.

Calyx not ribbed.

Leaves usually broad with a subcordate or cuneate base, calyx campanulate . . . 1. *C. Myxa*.

Leaves narrower, deeply dentate towards the apex, calyx cylindrical . . . 2. *C. crenata*.

Calyx distinctly ribbed, leaves tomentose beneath.

Leaves often subopposite, cordate and 3-5-nerved at the base . . . 3. *C. Macleodii*.

Leaves rounded or cuneate at the base, with usually three basal nerves . . . 4. *C. vestita*.

Leaves nearly or quite opposite, cuneate-oblong, with no distinct basal nerves . . . 5. *C. Rothii*.

1. *C. Myxa*, Linn.; Sp. Pl. 190; Roxb. Fl. Ind. i, 590; Royle III. 306; Brandis For. Fl. 336; Ind. Trees 478; F. B. I. iv, 136; Watt E. D.; Kanjilal For. Fl. 248; Gamble Man. Ind. Timb. 500; Collett Fl. Siml. 329; Prain Beng. Pl. 714; Cooke Fl. Bomb. ii, 199. *C. obliqua*, Willd.; Clarke in F. B. I. iv, 137; Watt E. D. *C. latifolia*, Roxb. Fl. Ind. i, 588.—Vern. *Lasora*.

A moderate-sized deciduous tree, up to 40 or 50 ft. high, and usually with a crooked trunk. Bark grey or brown, rough with shallow longitudinal furrows. Branchlets glabrous; young shoots silvery-grey. Leaves alternate, thinly coriaceous, 3-6 in. long, elliptic-lanceolate to broadly ovate or suborbicular, rounded cordate or somewhat cuneate at the base, entire or the margins more or less sinuate-dentate; upper surface glabrous, becoming scabrous when old, softly pubescent beneath when young, usually 3-nerved from near the base; petioles  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long. Flowers white, usually 5-merous, in large lax terminal and axillary peduncled cymes; peduncles 1-2 in. long, pedicels short. Calyx campanulate, about  $\frac{1}{4}$  in. long, glabrous outside, silky within, completely covering the corolla in bud, irregularly 5-toothed, accrescent in fruit. Corolla tube as long as the calyx; lobes equalling the tube, narrowly oblong, obtuse, recurved. Stamens exserted, filaments hairy below. Drupe  $\frac{1}{4}$ -1 in. long, ovoid, apiculate, yellow, pink or nearly black, shining, minutely rugose.

Abundant within the area, especially in the more hilly portions, often planted. Flowers during March and April, and the fruit ripens May-July. **DISTRIB.** Throughout the warmer parts of India and in Ceylon, ascending to 5,000 ft. on the Punjab Himalaya. It is found also in Egypt, China, Malaya and in Trop. Australia, but often cultivated. The wood, though soft, is strong and seasons well, but is liable to be attacked by insects; it affords, however, excellent fuel. The bark yields a fibre, and is also used medicinally. The leaves serve as plates and are largely used in Burma for covering cheroots. The ripe fruit (sebesten) is eaten either raw or pickled, also the kernels which have the taste of fresh filberts. The viscid pulp of the fruit is used medicinally as a demulcent, and is also employed as a bird-lime.

2. *C. crenata*, Delile Fl. Egypte 195, t. 20; DC. Prod. ix, 480. *C. Lowriana*, Brandis Ind. Trees 479. *Sebestena sylvestris*, P. Alp. Fl. Alg. vi., 17, t. 8.—Vern. *Gundi* (Merwára).

A shrub or small tree, wholly glabrous except the minutely hairy inflorescence. Branches terete, suberect. Leaves bright green on both sides, 1-3 in. long, elliptic or elliptic-lanceolate, rounded subacute or shortly acuminate at the apex, obliquely rounded or cuneate at the base, margins crenate-dentate or deeply dentate towards the apex, main lateral nerves faint, 4-6 on each side, the lowest pair from near the base. Flowers in small compact pedunculate cymes from the axils of the uppermost leaves. Calyx tube (in flower)  $\frac{3}{8}$  in. long, cylindrical: fruiting calyx campanulate,  $\frac{1}{2}$  in. across, glabrous outside, densely hairy within, margin crenate. Drupe  $\frac{3}{8}$ -in. long, ovoid, acute.

Forests of Merwára in Rájputána (Brandis, Dec. 1878; Lowrie Oct. 1884; Duthie Jan. 1886). Outside India it is at present known only as a cultivated tree in Egypt, as at Cairo and Alexandria where the fruit is eaten. It is undoubtedly indigenous in Rájputána, and may yet be found wild in some of the higher reaches of the Nile Valley, whence ripe fruits may have found their way to Egypt by water-carriage. It is

a smaller tree than *C. Myra* and much more glabrous; the leaves are smaller and narrower, and the calyx tube when in flower is more cylindrical. In foliage it somewhat resembles *C. nonoica*, Roxb., but the upper surface of the leaves is devoid of the raised white dots which characterize the latter. Brandis describes the heartwood as brown and beautifully mottled on a radial section. In Egypt the flowers are said to be fragrant.

3. *C. Macleodii*, Hk. f. and T. in Journ. Linn. Soc. ii, 128; Brandis For. Fl. 337; Ind. Trees 479; F. B. I. iv. 139; Watt E. D.; Gamble Man. Ind. Timb. 502; Prain Beng. Pl. 714; Cooke Fl. Bomb. ii, 200.—Vern. Dhengan.

A medium-sized deciduous tree up to 40 ft. high; the young parts under-side of leaves and inflorescence clothed with grey or fulvous tomentum. Leaves alternate or subopposite, 3-6 in. long, firm and hard when mature, ovate, cordate, obtuse, 3-5-nerved at the base; upper surface pubescent when young, becoming rough shining and covered with white raised disks and with the nerves deeply impressed when old; lower surface densely clothed with grey or fulvous tomentum; petioles 1-2 in., densely tomentose. Flowers white, subsessile, in dense terminal and axillary paniced tomentose cymes. Calyx  $\frac{3}{4}$  in. long, obconic, ribbed and tomentose; lobes unequal, short, obtuse, spreading or reflexed; male flowers with rudimentary ovary, but without style or stigma. Stamens usually 6, exserted, filaments hairy at the base, anthers of male flowers large. Drupe about  $\frac{1}{2}$  in. long, ovoid, acute.

In the Sub-Himalayan tracts of Pilibhit and N. Oudh, also in Bundelkhand and Rajputana. Flowers during April and May. DISTRIB. Chota Nagpur, C. India and in the C. Provinces, Bombay, Deccan, Orissa and the Circars. The timber is hard and tough, and much used for making carts, agricultural implements and furniture, also for fishing rods. The heart-wood is light brown, mottled with darker veins. The fruit is not edible.

4. *C. vestita*, Hk. f. and T. in Journ. Linn. Soc. ii, 128; Brandis For. Fl. 338; Ind. Trees 480; F. B. I. iv, 139; Watt E. D.; Kanjilal For. Fl. 249; Gamble Man. Ind. Timb. 502; Collett Fl. Siml. 330. *C. incana*, Royle III. 306 (nam. only).—Vern. Kum-paiman, baiola (Dehra Dun), lafora (Oudh), godela (Ajmere).

A small deciduous tree with a low rounded crown, up to 30 ft. high; young parts, under-side of leaves and inflorescence clothed with grey or fulvous pubescence. Bark grey or greenish, smooth, exfoliating when old in large woody scales, inner bark silvery-gray. Leaves coriaceous, scabrous above, tomentose beneath until mature, usually 3-nerved from near the base; petioles 1-1 $\frac{1}{2}$  in. long. Flowers pedicelled, yellowish-white, in dense compound cymes, the male flowers usually in unilateral racemes. Calyx tubular-clavate, about  $\frac{1}{2}$  in. long, teeth unequal. Corolla-tube  $\frac{1}{2}$  in. long, equalling the calyx; lobes ovate-oblong, spread-



ing, as long as the tube. *Drupe*  $\frac{1}{2}$ - $\frac{3}{4}$  in long, ellipsoid, acute, supported by the saucer-shaped or campanulate strongly ribbed accrescent calyx.

Sub-Himalayan forests from Dehra Dun and the Siwalik range eastwards to the Sarda River in N. Oudh. Flowers in March and April with the young leaves, and the fruit ripens in October. *DISTRIB.* Panjab, westwards as far as Jhelum, but not common. The wood is strong and hard and is used for wheels and well-work, and also for furniture. The gelatinous fruit is eaten, and is regarded as superior to that of *C. Myra*.

5. *C. Rothii*, Ræm. and Sch. Syst. iv, 708; Brandis For. Fl. 338; Ind. Trees 480; F. B. I. iv, 138; Watt E. D.; Gamble Man. Ind. Timb. 501; Cooke Fl. Bomb. ii, 202. *C. angustifolia*, Rorb. Fl. Ind. i, 595; Royle Ill. 306.—Vern. *Gondi*, *gondni*.

A small tree, about 30 ft. high, with greyish deeply furrowed bark. *Leaves* nearly or quite opposite, 2½-4 in. long, cuneate-oblong, entire, apex rounded, rough above and more or less pubescent beneath; nerves pinnate, 4-6 pairs, rather obscure; petioles  $\frac{1}{2}$  in. *Flowers* small, white, usually 4-androus, arranged in lax terminal or axillary pedunculate cymes; peduncles  $\frac{1}{2}$ -1 in. long, pedicels short. *Calyx*  $\frac{1}{2}$  in. long, minutely pubescent outside, silky within; lobes obtuse, small. *Corolla*  $\frac{1}{2}$  in. long; lobes usually 4, as long as the tube, oblong, obtuse, reflexed. *Filaments* glabrous. *Drupe* about  $\frac{1}{2}$  in. long, usually 1-seeded, ovoid, mucronate, striate, yellow or reddish-brown when ripe.

Found wild in the Merwára and Bundelkhand districts, planted or self-sown in other places within the area. Flowers April-June and the fruit ripens during the following cold season. *DISTRIB.* In the drier parts of India from the Panjab, Sind and Rajputana to Gujarat and the Deccan, also in the dry region of Ceylon, extending to Arabia and Abyssinia. The wood is valued for building and for agricultural implements, the bark yields a gum, the inner bark is made into ropes, and the pulp of the fruit is eaten.

. *EHRETIA*, Linn.; Fl. Brit. Ind. iv., 141.

Shrubs or trees, scabrous or glabrous. *Leaves* alternate. *Flowers* small, usually white, in terminal or axillary corymbes or paniced cymes, rarely on 1-flowered axillary peduncles. *Calyx* small, 5-partite. *Corolla* with a short cylindrical tube; lobes 5, spreading or reflexed, imbricate in bud. *Stamens* 5, on the corolla-tube; anthers usually exserted. *Ovary* 2-celled, ovules 2 in each cell; style terminal, cylindric, bifid or bipartite or styles 2; stigmas small, capitate. *Fruit* a small subglobose drupe, with 4 or (by suppression) 3-1 seeds; endocarp hard, consisting of one 4-celled or two 2-celled or four 1-celled pyrenes. *Seeds* straight, albumen scanty.—Species about 55, in tropical and subtropical regions chiefly of the Old World.

Leaves serrate . . . . . 1. *E. acuminata*.

Leaves entire.

Leaves ovate to elliptic, up to 5 in. long,  
glabrous beneath.—A tree . . . . . 2. *E. lævis*.

Leaves usually obovate or spatulate, less  
than 3 in. long, pubescent beneath.—A  
shrub . . . . . 3. *E. aspera*.

1. *E. acuminata*, R. Br. *Prod.* 497; *F. B. I. iv*, 141; *Watt E. D.*; *Kanjilal For. Fl.* 250; *Gamble Man. Ind. Timb* 503; *Collett Fl. Siml.* 330; *Brandis Ind. Trees* 491. *E. serrata*, Roxb.; *Fl. Ind. i*, 596; *Royle Ill.* 303; *Brandis For. Fl.* 339.—Vern. *Punyan pandāyan* (Dehra Dun).

A medium-sized tree up to 40 ft. high. Bark thick grey, marked with longitudinal cracks and furrows. Leaves 3-5 in. long, elliptic or ovate-oblong, acuminate, sharply serrate, rather thin, almost glabrous, shining above, petioles slender,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. Flowers white, fragrant, in subsessile fascicles forming large dense compound panicles. Calyx-lobes obtuse. Corolla-lobes  $\frac{1}{2}$  in. long, reflexed. Drupe about the size of a small pea, red orange or nearly black when ripe; pyrenes 2, each 2-seeded.

Dehra Dun and eastwards along the base of the Himalaya in Rohilkhand and N. Oudh. Flowers during March and April. **DISTRIB.** Sub-Himalayan tracts westwards to the Indus and eastwards to Bhutan; also in N. Bengal, Chittagong, Upper Burma, extending to China, Japan, Malaya and N. Australia. A handsome tree when in flower. The wood, which resembles that of the ash, is used for various purposes. The fruit is eaten, and the leaves, etc., are collected for fodder.

2. *E. lævis*, Roxb. *Cor. Pl. i*, 42, t. 56; *Fl. Ind. i*, 597; *Royle Ill.* 306; *Brandis For. Fl.* 340, t. 42; *Ind. Trees* 491; *F. B. I. iv*, 142; *Watt E. D.*; *Kanjilal For. Fl.* 250; *Collett Fl. Siml.* 330; *Prain Beng. Pl.* 718; *Cooke Fl. Bomb. ii*, 203. *E. floribunda*, and *E. pubescens*, Benth in *Royle Ill.* 305.—Vern. *Chamror, tamboli* (Bundelkhand).

A small tree, 30-40 ft. high, glabrous or more or less pubescent. Bark thick, greyish, smooth. Leaves  $2\frac{1}{2}$ -5 in. long, elliptic or obovate, often unequal-sided, entire, subacute acuminate obtuse or emarginate at the apex, cuneate rounded or subtruncate at the base, dark green above, paler beneath, glabrous or nearly so when mature, main lateral nerves 6-10, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. Flowers white, sessile or subsessile, in much branched glabrous or pubescent axillary and terminal corymbose peduncled cymes composed of unilateral spikes or racemes, bracts none. Calyx pubescent; lobes  $\frac{1}{10}$  in. long, ovate, acute. Corolla rotate, tube  $\frac{1}{10}$  in. long; lobes oblong, obtuse. Filaments glabrous; anthers exsert, not apiculate. Drupe almost 2-lobed,  $\frac{1}{2}$  in. in diam., rather broader than long, red at first, becoming black and wrinkled when dry.

abundant in forests along the base of the Himalaya, especially in damp and shady places; also in Bundelkhand. Flowers before or with the

young leaves from February to April. **DISTRIB.** In deciduous forests throughout India and in Ceylon, ascending to 3,000 ft. on the Himalaya; also in Baluchistan, Persia, China and Australia. The grey or brownish-grey wood is tough and durable and is used for agricultural implements and for building purposes. The insipid fruit also the inner bark are eaten during famine times, and the leaves afford good fodder. The leaves are said to be employed in N. Oudh as a substitute for *pán*. In the Flora of Brit. India descriptions of five varieties or forms of this polymorphous species are given. *E. floribunda* has acuminate and softly pubescent and ciliate leaves, and the flowers are arranged in large axillary corymbs towards the ends of the branches, often forming quasi-panicles 6 in. in diam. In *E. pubescens*, which is a more than usually pubescent form, the leaves (even when mature) are softly hairy beneath and scabrous and often hairy above, thus indicating an approach to *E. aspera* of Roxburgh.

3. *E. aspera*, Roxb. Cor. Pl. i, 41, t. 55; Fl. Ind. i, 598, Cooke ii, 204. *E. obtusifolia*, Hochst.; Brand. For. Fl. 340; Ind. Trees 481; Clarke in F. B. I. iv, 142; Gamble Man. Ind. Timb. 504; *E. lævis*, var. *aspera*, Clarke in F. B. I. 1.c.

A shrub, usually with short terete glabrous branches which are downy when young. Leaves variable,  $\frac{3}{4}$ -2 $\frac{1}{2}$  in. long, obovate spathulate or elliptic-oblong, rounded retuse or shortly acuminate at the apex, scabrous and sometimes slightly hairy on the upper surface, persistently hairy, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. Flowers white or blueish, in dense apparently terminal corymbose cymes, afterwards becoming paniculate lax and lateral. Calyx  $\frac{1}{16}$  in. long, hairy outside; lobes  $\frac{1}{16}$  in. long, ovate-oblong, subacute, ciliate. Corolla-tube longer than the calyx; lobes about equalling the tube, oblong, obtuse. Ovary ovoid, style bifid from below the middle, stigma capitate. Drupe  $\frac{1}{4}$  in. across, depressed-globose, smooth, containing usually 4 bony pyrenes.

Merwára in Rajputana and in Kheri district of N. Oudh. Flowers March-May. **DISTRIB.** Punjab, on the Salt Range, and in the Deccan country of Bombay, extending to the drier parts of S. India and Upper Burma; also in Baluchistan, Afghanistan and Abyssinia. The wood resembles that of *E. lævis*.

### 3. *COLDENIA*, Linn.; Fl. Brit. Ind. iv, 144.

Branching diffuse or prostrate scabrous herbs. Leaves alternate, small, often crisped or plicate. Flowers white or yellow, axillary, sessile or nearly so, the upper often in one-sided spikes. Calyx 4-5-partite, lobes lanceolate or linear. Corolla-tube short, funnel-shaped; lobes 4-5, spreading, imbricate in bud. Stamens 4-5, on the corolla-tube, included. Ovary 2-celled, with two ovules in each cell, or 4-celled and with a single ovule in each cell, styles 2, distinct

from the base or slightly cohering upwards, stigmas capitate. *Fruit* an almost dry drupe of 4 subconnate 1-seeded pyrenes. *Seeds* with a thin testa, albumen scanty or none, cotyledons flat.—Species 11, all American except the following which is widely distributed throughout the warmer parts of the world.

**C. procumbens**, Linn. *Sp. Pl.* 125; Roxb. *Fl. Ind.* i, 443, *F. B. I.* iv, 144; Watt. *E. D.*; Prain *Beng. Pl.* 718; Cooke *Fl. Bomb.* ii, 205.—Vern. *Tripanki*.

A procumbent herb with long flat trailing stems; the young parts clothed with white silky hairs. *Leaves* crisped 1-1½ in. long, obovate-oblong, rounded at the apex, narrowed below into the shaggy petioles; margins coarsely serrate or subpinnatifid, scabrous and very hairy on both sides. *Flowers* yellow. *Calyx* 4-partite, very hairy; segments ⅓ in. long, ovate, acute, ciliate. *Corolla* as long as the calyx; lobes 4, oblong, rounded. *Stamens* 4 hardly exerted. *Drupe* about ½ in. long pyramidal, 4-lobed, muriculate, separating when ripe into four 1-seeded pyrenes. *Seeds* albuminous.

A weed in moist ground, especially on the edges of tanks and in rice fields. *Flowers* September and October. *DISTRIB.* Throughout the hotter parts of India and in Ceylon, extending to Burma, China, Africa, Australia and America. The fresh leaves are applied to rheumatic swellings.

#### 4. RHARDIA, Mart.; *Fl. Brit. Ind.* iv, 144.

A glabrous or more or less pubescent shrub, branches twiggy. *Leaves* small, alternate or clustered, entire or obscurely toothed. *Flowers* small, reddish-lilac, subterminal on short lateral branchlets. *Calyx* 5-partite; lobes lanceolate, acuminate, imbricate. *Corolla* deeply 5-cleft; tube short, subcampanulate; lobes oblong, imbricate in bud. *Stamens* 5, on the corolla-tube. *Ovary* ovoid, 2-celled, cells 2-ovuled, or imperfectly 4-celled with one ovule in each cell, style terminal, stigma capitate or obscurely 2-lobed. *Drupe* with 4 crustaceous 1-seeded pyrenes. *Seeds* oblong, albumen scanty; cotyledons ovate, not plicate.—Species 1, in tropical Asia, Africa and in S. America.

**R. lycioides**, Mart. *Nov. Gen. and Sp.* ii, 137, t. 195; *F. B. I.* iv, 145; Gamble *Man. Ind. Timb.* 504; Prain *Beng. Pl.* 717; Cooke *Fl. Bomb.* ii, 205; Brandis *Ind. Trees* 432. *R. viminea*, Dalz.; Brandis *For. Fl.* 341 and 577. *R. sericea* and *fluvialis*, Edgew., *Pl. Banda* 41.

A small shrub, 2-6 ft. high; branches often creeping and rooting; the young parts pubescent. *Leaves* subsessile, ¼-1 in. long, spatulate

entire, rounded at the apex and sometimes apiculate, glabrous or more or less hispid. *Flowers* shortly stalked; bracts lanceolate, acute. *Calyx*  $\frac{1}{2}$  in. long, fleshy, sparsely hairy; lobes unequal, ciliate. *Corolla* less than  $\frac{1}{2}$  in. long; lobes twice as long as the tube, spreading. *Stamens* exserted. *Fruit* subglobose,  $\frac{1}{2}$  in. in diam., nearly dry and red or orange-coloured when ripe.

Edges of sandy and rocky beds of streams in Bundelkhand, often completely submerged during the rainy season. *Flowers* in October and November. *DISTRIB.* Beds of streams in Kumaon ascending to 2,500 ft.; also in Assam and in C., W. and S. India to Ceylon, common in Tenasserim and extending to Trop. Africa and Brazil. Edgeworth's *R. sericea*, distinguished by its very silky pubescence, is abundant on the banks of the Sarju river in Kumaon. His *R. fluvialis* is wholly glabrous, and grows on granite rocks in the bed of the Ken river in Bundelkhand, where, after remaining submerged for several weeks, its long branches hang down into the water when the rocks are left exposed.

### 5. HELIOTROP IUM. Linn. ; Fl. Brit. Ind. iv, 148.

Annual or perennial herbs, rarely shrubby, usually villous or scabrous. *Leaves* alternate, rarely subopposite. *Flowers* usually small, white or pale purple, usually in terminal dichotomous cymes, with often long and scorpioid branches; bracts small or none, or sometimes leafy. *Calyx* 5-lobed; lobes lanceolate or linear, rarely short. *Corolla-tube* cylindrical, throat usually naked; lobes 5, imbricate or induplicate, usually spreading in flower. *Stamens* 5, on the corolla-tube, included, filaments very short. *Ovary* more or less perfectly 4-celled, ovules 1 in each cell; style terminal, short or long, with a depressed stigmatic ring below the apex; stigma above the disk none or short or elongate, rarely with 2 linear branches. *Fruit* dry or somewhat fleshy, 2- or 4-sulcate or lobed, at length splitting into 4 distinct or germinately cohering nutlets, 1 or 2 of which are often suppressed. *Seeds* straight or curved, albumen usually scanty.—Species about 220, in warm and temperate regions of both hemispheres.

Leaves up to 4 in. long, ovate, subserrate;  
fruit 4-beaked, separating into 2 nut-like  
2-seeded pyrenes . . . . . 1. *H. indicum*.

Leaves not exceeding 2 in. long; fruit not  
beaked, separating into 2-4 nutlets.

*Calyx* enveloping the fruit, lobes short,  
flowers in short woolly spikes. A prostrate villous annual . . . . . 2. *H. supinum*.

Calyx not enveloping the fruit, lobes long and narrow.

Corolla-lobes caudate-acuminate. An erect hispid annual . . . 3. *H. subulatum*.

Corolla-lobes not caudate-acuminate.

Corolla-lobes with intermediate teeth spikes obraceate. An erect herb branched from a woody base 4. *H. Eichwaldi*.

Corolla-lobes without intermediate teeth, spikes bracteate.

Leaves elliptic or obovate, obtuse, bracts persistent . 5. *H. ovalifolium*.

Leaves narrowly lanceolate or linear, acute.

Spikes not conspicuously bracteate upwards.

A small shrub-like herb with stiff ascending branches . . . 6. *H. zeylanicum*.

A much branched procumbent herb . . . 7. *H. strigosum*.

Spikes conspicuously bracteate throughout . 8. *H. marifolium*.

1. *H. indicum*, Linn. Sp. Pl. 130; Roxb. Fl. Ind. i, 454; F. B. I. iv, 152; Watt E. D.; Prain Beng. Pl. 716; Cooke Fl. Bomb. ii, 207.

A coarse, diffuse, hairy annual,  $\frac{1}{2}$ -2 ft. high. Stem stout and somewhat succulent but woody at the base; branches ascending, clothed with stiff spreading hairs. Leaves alternate or sub-opposite, petioled, 1-4 in. long, ovate or ovate-oblong, obtuse or subacute, sparsely hairy above, minutely pilose beneath, margins undulate or subserrate, base rounded or cordate or decurrent into the petiole, nerves prominent beneath. Spikes 2-6 in. long, usually extra-axillary, simple or forked, obraceate hispid. Flowers pale-violet, sessile, 2-ranked. Calyx 5-partite,  $\frac{1}{4}$  in. long, sparsely bristly outside; segments unequal, narrowly lanceolate, acute. Corolla funnel-shaped,  $\frac{1}{2}$  in. long, hairy outside, tube slender, cylindric, slightly dilated at the base; lobes very small, rounded, reflexed. Stigma shorter than the style, with an annular frill at the base; apex short, obtuse. Fruit  $\frac{1}{2}$  in. long, deeply 2-lobed, each lobe bluntly 4-ribbed, containing 2 angular beaked 1-seeded pyrenes, each with an empty cavity on the inner side. Seeds white, subquadrate.

Common in moist places and often as a weed on rubbish heaps and by roadsides. Flowers Oct. DISTRIB. Throughout the hotter parts of India and in Ceylon; also in Malaya, China, Trop. Africa and America. The plant is used as a local application to boils and stings of sorts.

2. *H. supinum*, Linn. *Sp. Pl.* 130; *Royle Ill.* 506; *F. B. I.* iv, 149; *Prain Beng. Pl.* 715; *Cooke Fl. Bomb.* ii, 209.

A prostrate villous herb. Stems spreading, densely clothed with soft white hairs. Leaves petioled,  $\frac{1}{2}$ -1 in. long, elliptic or ovate, obtuse plicate, entire or more or less crenate, villous on both sides. Flowers subsessile, in short simple or forked villous spikes. Calyx  $\frac{1}{2}$  in. long, hairy on both sides, lobes short but easily separable downwards. Corolla  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; lobes very small, rounded. Anthers lanceolate, acute. Style a little longer than the stigma; stigma conical or subcylindric, stigmatic ring conspicuous. Nutlets 1-4, enveloped by the calyx, ovate in horizontal section, dark-brown, rounded and somewhat tuberculate on the back, and usually more or less margined when the nutlets are fewer than four.

Abundant over the greater portion of the area, especially as a weed of cultivation. In Bundelkhand and C. India it is very common on the black soil tracts. **DISTRIB.** Throughout the hotter parts of India and in Ceylon, extending to S. Europe, N. and S. Africa and the Canary Islands.

3. *H. subulatum*, Hochst. ex Martelli *Fl. Bogos.* 95. *H. zeylanicum*. *F. B. I.* iv, 148 (not of Lamk.); *Wight Ic.* t. 892; *Cooke Fl. Bomb.* ii, 207. *Tournefortia subulata*, Hochst. in *DC. Prod.* ix, 528. *T. Royleana* DC. *Prod.* ix, 527. *T. Edgeworthii*, DC. l. c. 529. *T. zeylanica*, *Wight Ill.* t. 170. *Messerschmidia hispida*, Benth. in *Royle Ill.* 306.

An erect annual, 1-3 ft. high, scabrous and hispid with stiff bulbous-based hairs. Leaves 1-2 in. long, sessile or nearly so, narrowly lanceolate, acute, subentire, tapering towards the base, nerves indistinct above. Flowers sessile, in elongated, simple or branching cernate spikes, unilateral or sometimes 2-ranked, especially towards the apex of the spike. Calyx  $\frac{1}{5}$  in. long, divided to the base, hairy on both sides; segments ovate, acute, ciliate. Corolla-tube  $\frac{1}{2}$  in. long, wider upwards, setose outside; lobes caudate-acuminate, spreading. Stamens attached to the swollen portion of the corolla-tube; anthers sessile, bifid at the apex. Style glabrous,  $\frac{1}{2}$  in. long, the stigmatic ring supporting a long cone which is penicillate with white shining hairs. Nutlets 4,  $\frac{1}{2}$  in. long, rounded and rugose or tuberculate on the back.

Confined to the drier western portion of the area in the neighbourhood of Delhi (Royle, Vicary, T. Thomson) and of Agra (Munro). Flowers October-January. **DISTRIB.** Punjab Plain, in the districts of Ludhiana, Lahore, Ferozepur, Multan, and on the Salt Range; also in Sind, Gujarat and from the Konkan southwards to Coimbatore in S. India, extending to Trop. Africa.—I fully agree with Trimen (*Fl. Ceyl.* part iii, p. 199) in recommending the adoption of another name for this species, for the very good reason that Lamarck based the description of his *H. zeylanicum* on Burmann's *H. curassivicum* var. *zeylanicum* (*Fl. Ind.* 41, t. 16, fig. 2), and that Burmann's figure represents, without doubt, *H. paniculatum*, R. Br., a species which is known to occur in

Ceylon. Dr. Cooke (Fl. Bomb. ii, 208, in note), while agreeing with Trimen in his contention, has, however, kept up the original name in order to avoid the inconvenience which often follows the alteration of a long-established name. At the same time he has suggested what should be the correct name in the event of a change in nomenclature being found necessary. Believing, however, such a step is more likely in the present instance to prevent than create confusion in the future, I have decided to adopt Dr. Cooke's proposed name *H. subulatum*. Hochst.) for the *H. zeylanicum* of the Fl. Brit. Ind., and to substitute for *H. paniculatum* Lamarck's older name, *H. zeylanicum*.

4 *H. Eichwaldi*, Steud. ex DC. Prod. ix, 535; F. B. I. iv, 149; Watt E. D.; Cooke Fl. Bomb. ii, 210.

An erect herb, branching from a woody base. Stems and branches clothed with soft usually bulbous-based hairs. Leaves 1—1½ in. long, elliptic-oblong or obovate, obtuse, usually tapering to the base, clothed on both sides with bulbous-based hairs, nerves more or less prominent beneath; petioles of lower leaves much longer than those of the upper. Spikes short obraceate, in pairs or ternate, helico d at the apex when young. Calyx 5-partite; segments ovate-lanceolate, acute, densely hairy on both sides. Corolla-tube ½ in. long narrowly cylindric, hairy outside; lobes small, rounded, with a crenulate margin. Style very short, stigma with a broad-based conical appendage bifid at the apex, stigmatic ring not conspicuous. Nutlets 4, ellipsoid, ⅙ in. long, obtuse at both ends, minutely verrucose and puberulous. Merwára (Duthie) Flowers November-January. DISTRIB. Sind, Punjab, Kashmir and W. Tibet extending to Australia. The leaves are applied externally as a remedy for stings, and internally as an emetic.

5 *H. ovalifolium*, Forsk. Fl. Ægypt-Arab. 38; F. B. I. iv, 150; Prain Beng. Pl. 716; Cooke. Fl. Bomb. ii, 211. *H. obovatum*. Don. Prod. 101. *H. coromandelianum*, Koen. ex Retz., Roxb. Fl. Ind. i, 454.

An erect decumbent or almost prostrate herb, densely clothed with long, white, appressed, silky hairs. Stems often woody below. Leaves ¼-½ in. long, elliptic or obovate, mucronate or not, narrowed towards the base, covered with long, appressed silky hairs; petioles of lower leaves about ½ in. long; those of the upper shorter. Flowers white, 1-or-2 ranked, in compact hairy usually forked spikes 2-4 in. long; bracts persistent, ⅙-⅓ in. long, ovate, acute. Calyx deeply 5-partite, ⅙ in. long hairy on both sides; segments very unequal, ovate or linear-oblong, bristle pointed and densely ciliate, not deciduous with the fruit. Corolla ½ in. long tube cylindric, hairy outside and in the throat; lobes small, ovate-oblong, acute, without intermediate teeth. Ovary glabrous, style very short; stigma conical, minutely hairy at the tip, stigmatic ring not conspicuous. Nutlets four, ⅓ in. long, subacute, densely silky on the back, 1-seeded.

Upper Gangetic Plain. (Royle). DISTRIB. Bengal and Sind to Bombay and S. India; also in Upper Burma extending to Australia and Trop. Africa.



6. *H. zeylanicum*, Lamk. *Encycl. Method.* ii, 94 (not of Wall. nor of F. B. I.); Heyne in *Herb. Rottl.* *H. paniculatum* R. Br. *Prod.* 494 not of Roxb.; Clarke in *F. B. I.* iv, 151; Cooke *Fl. Bomb.* ii 212. *H. linifolium*, Lehm. *H. glabellum*, R. Br. *H. curassavicum* var. *zeylanicum*, Burm. *Fl. Ind.* 41, t. 16, fig. 2. *Cynoglossum zeylanicum* in *Herb. Wight*. *Myosotis fruticosa*, Linn. *Mant.* ii, 201.

An erect herb, 1-2 ft. high, with numerous rigid ascending branches. Stems and branches more or less strigose or somet. mes quite glabrous. Leaves up to 1 in. long, sessile or nearly so, linear, acute, clothed on both sides with appressed hairs or the upper surface glabrous, margins recurved. Flowers shortly pedicelled, in slender simple or forked racemes 2-6 in. long; bracts  $\frac{1}{2}$  in. long, linear, hairy. Calyx 5-partite, strigose outside; segments ovate, acute. Corolla  $\frac{1}{2}$  in. long, hairy outside; lobes ovate-deltoid, the sinuses plicate. Style very short; stigma conical, a little longer than the style. Stigmatic ring conspicuous. Fruit subglobose, depressed, shorter than the spreading persistent calyx-segments. Nutlets 4,  $\frac{1}{8}$  in. long, acute at the apex, hairy on the back.

Confined to the N. W. portion of the area, but not common. DISTRIB. Punjab Plain, in the districts of Hissar (Duthie) and Jhelam (Aitchison), also in Sind, Bombay, S. India and Ceylon, extending to Pegu, Siam and Australia. See remarks under *H. subulatum*.

7. *H. strigosum*, Willd. *Sp. Pl.* i, 743; *F. B. I.* iv, 151; Watt *E. D.*; Collett *Fl. Sum.* 330; Prain *Beng. Pl.* 716. *H. brevifolium*, Wall.; Royle *Ill.* 306. *H. compactum*, Don. *Prod.* 101.

A small much branched usually procumbent, strigose perennial herb, woody at the base. Branches few, slender. Leaves  $\frac{1}{2}$ -1 in. long, linear, becoming smaller upwards. Flowers less than  $\frac{1}{10}$  in. long; bracts linear or the lowest leaf-like. Calyx-lobes ovate, acute, enlarging in fruit. Corolla salver-shaped. Stigma narrowly conical. Fruit depressed at the apex, of 4 minute more or less united glabrous or slightly hairy nutlets.

Abundant within the area. DISTRIB. W. Himalaya, up to 5,500 ft., and throughout India, extending to Baluchistan, Burma, Malaya, China and Australia. *H. brevifolium*, Wall., reduced to a variety in *F. B. I.* l. c. differs only by its shorter leaves.

8. *H. marifolium*, Retz. *Obs.* ii, 8; *F. B. I.* iv, 152; Prain *Beng. Pl.* 716; Cooke *Fl. Bomb.* ii. 213. *H. marifolium* var. *Wallichii* Clarke in *F. B. I.* l. c. *H. scabrum*, Retz.; *F. B. I.* l. c. *Cynoglossum marifolium*, Roxb. *Fl. Ind.* i, 457.

A much branched procumbent, perennial herb. Stems woody at the base spreading along the surface of the ground often to a considerable distance, appressedly hairy. Leaves  $\frac{1}{2}$ -1 in. long or more, ovate lanceolate or oblanceolate, acute, densely clothed with appressed hairs, petioles very short. Flowers in axillary and terminal bracteate spikes, 1-2 in. long; bracts leaf-like, lanceolate. Calyx  $\frac{1}{2}$  in. long, clothed on

both sides with long, slender hairs; segments slightly unequal, lanceolate, ciliate. *Corolla*  $\frac{1}{2}$  in. long; tube cylindric, hairy outside, glabrous within; lobes minute, ovate, acute, with broad plicate sinuses and minute teeth between the segments. *Ovary* ovoid, style very short; stigma bluntly conical or cylindric at the apex, stigmatic ring conspicuous. *Fruit* subglobose, bristly, separating into 4 chestnut-brown nutlets.

Bundelkhand (Edgeworth) DISTRICT. Throughout the hotter parts of India and in Ceylon.

*H. peruvianum*, Linn., popularly known in England as *Cherry pie*, is much grown in the gardens of Upper India for its scented flowers. It is a native of S. America.

## 6. TRICHODESMA. R. Br.; Fl. Brit. Ind. iv, 153.

Erect, usually hispid herbs. *Leaves* opposite or the upper alternate, entire. *Flowers* solitary on axillary pedicels passing into terminal racemes by the gradual reduction of the floral leaves. *Calyx* deeply 5-lobed, enlarged in fruit; lobes angled winged or auricled at the base. *Corolla-tube* campanulate-cylindric or 5-gonous, throat without scales or slightly closed by the intrusion of the sinuses; lobes 5, often long-acuminate, overlapping to the left. *Stamens* 5, on the corolla-tube; anthers erect, elongate, lanceolate, connivent in a cone; connectives more or less hairy on the back, their tips excurrent and at length twisted. *Ovary* 4-lobed; style terminal, filiform, stigma small, ovules subhorizontal. *Fruit* pyramidal, sub-4-ridged; nutlets 4, broad, with smooth, shining backs and scabrous more or less margined inner faces, which are at first closely adnate to the carpophore, finally separating.—Species about 10, in tropical and subtropical Africa, Asia and Australia.

Calyx-lobes in fruit cordate or hastate at the base . . . . . 1. *T. indicum*.

Calyx-lobes in fruit rounded at the base . . . . . 2. *T. zeylanicum*.

1. *T. indicum*, R. Br. *Prod.* 496; Royle *Ill.* 304; F. B. I. iv, 153; Watt *E. D.*; Collett *Fl. Siml.* 331; Prain *Beng. Pl.* 720; Cooke *Fl. Bomb.* ii. 214 *T. amplexicaule*, Roth; Clarke in F. B. I. l. c. *T. indicum* var. *amplexicaule*, Cooke *Fl. Bomb.* l. c. *T. hirsutum*, Edgew. *Pl. Banda* 51. *T. ineguale*, Edgew. l. c. *Borrigo indica*, Linn.; Roxb. *Fl. Ind.* i, 458. *B. spinulosa*, Roxb. l. c. 459.

An annual herb, rough with appressed hairs bulbous-based stiff hairs. *Stems* erect or diffuse, up to 18 in. long. *Leaves* mostly sessile, 1-4 in. long, ovate oblong or lanceolate, obtuse or subacute, base narrowed,

cordate; upper surface clothed with stiff hairs seated on flattened circular tubercles; lower surface less harshly hispid, more or less villous or quite glabrous except on the nerves and veins. *Flowers* pale blue, changing to pink or white. *Calyx* about  $\frac{1}{2}$  in. long, clothed with long rather stiff hairs; segments lanceolate, acute, cordate or hastate at the base. *Corolla*  $\frac{1}{2}$  in. long; limb oblique, funnel-shaped; lobes ovate, abruptly acuminate. *Nutlets*  $\frac{1}{2}$  in. long, smooth and polished on the back, rugose on inner face, scarcely margined, white or blueish when ripe,

Plentiful by road-sides and in waste ground throughout the area. *Flowers* during the cold season. *DISTRIB.* Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya; extending to Afghanistan, Baluchistan, Persia and the Mauritius. A most variable species as regards indumentum. In what may be regarded as typical *T. indicum*, the stems and leaves are more or less villous, and sometimes much less so than in specimens which have been referred to *T. amplexicaule*; and, as there are no other characters by which they can be distinguished it will be more satisfactory to consider the latter merely as a climatal form.

*2. T. zeylanicum*, R. Br. *Prod.* 496; Royle *Ill.* 304; F. B. D. iv, 154; Watt *E. D.*; *Prair Beng. Pl.* 720; *Cooko Fl. Bomb.* ii, 215. *Borrage zeylanica*, Linn.; Roxb. *Fl. Ind.* i, 459.

An erect annual, 1-2 ft. high. *Stems* stout, densely pilose, often tinged with purple. *Leaves* sessile or shortly petioled, 2-4 in. long, lanceolate or oblong, obtuse or acute, upper surface covered with short stiff, bulbous-based hairs, finely pubescent beneath. *Flowers* pale-blue, usually in terminal bracteate panicles, or with a few solitary ones in the upper axils; pedicels slender, pubescent, nodding; bracts leaf-like. *Calyx* softly pubescent, rounded at the base; lobes  $\frac{1}{2}$  in. long, lanceolate, acute, hairy within, midrib prominent. *Corolla-tube*  $\frac{1}{2}$  in. long; lobes obovate, rounded, plicate, with a spirally twisted acuminate apex. *Nutlets* grey when ripe, otherwise resembling those of *T. indicum*.

Bundelkhand (Mrs. Bell). *Flowers* in Jan. *DISTRIB.* From Chota Nagpur and Bombay to S. India and Ceylon; extending to Malaya, Australia and the Mascarene Islands. The leaves are used medicinally.

## 7. CYNOGLOSSUM, Linn. Fl. Brit. Ind. iv, 155.

Erect, hairy, biennial or perennial herbs. *Leaves* alternate, radical petioled. *Flowers* blueish or purple, usually in elongate sparingly branched paniced racemes, ultimately distant, sessile, or the lower shortly pedicelled, bracts none. *Calyx* 5-partite, spreading in fruit, sometimes slightly enlarged. *Corolla-tube* short, with 5 obtuse or emarginate scales in the throat; lobes 5, obtuse, spreading, imbricate in bud. *Stamens* 5, adnate to the corolla-tube and included beneath the scales. *Ovary* distinctly 4-lobed, style short or long, from between the bases of the lobes, stigma small. *Nutlets* 4-forming a

much depressed pyramid, adnate to a conic-based linear carpophore; their bases rounded and produced downwards, outer faces convex or flat, with or without a margin and more or less glabrous. —Species about 60, in tropical and subtropical regions of both hemispheres.

Nutlets obscurely or not at all margined. . . 1. *C. lanceolatum*.

Nutlets with a prominent margin . . . 2. *C. denticulatum* var. *zeylanica*.

1. *C. lanceolatum*, Forsk. *Fl. Egypt.* 41 (not of Heyne), *F. B. I.* iv, 156, *Prain Beng. Pl.* 719. *C. racemosum*, Roxb. *Fl. Ind.* i, 456.

An erect hispid annual, about 1½ ft. high. *Leaves* sessile, 2-3 in. long, broadly lanceolate, nerves prominent beneath. *Racemes* with all the flowers, or all but the uppermost pedicelled elongating in fruit. *Flowers* at first erect, afterwards nodding. *Calyx-lobes* obtuse, ½ in. long in fruit. *Corolla* very small, white with a purple throat. *Nutlets* ½ in. in diam., shortly ovate, hardly or not at all margined, glochidiate on all sides.

Sub-Himalayan tracts from Dehra Dun eastwards; Mohand Pass on the Siwalik Range (Royle III 306 under *C. furcatum*). *DISTRIB.* frequent in Bengal, westwards to Lahore, extending to Arabia.

2. *C. denticulatum*, var. *zeylanica*, *C. B. Clark* in *F. B. I.* iv, 157; *Cooke Fl. Bomb.* ii, 217. *C. zeylanicum*, *Thunb.*

An erect, branching, annual herb, 1-2 ft. high, clothed with spreading or appressed hairs. *Leaves* 1½-3 in. long, lanceolate and usually acute, narrowed towards the base and often decurrent; upper surface covered with short stiff hairs seated on bulbous bases which become white when dry; lower surface usually strigose and with prominent densely hairy nerves; margins more or less denticulate, ciliate. *Flowers* distant, pedicelled, in terminal and axillary racemes 6-8 in. long. *Calyx* ½ in. long, softly hairy, enlarged when in fruit; lobes ovate-oblong, obtuse, ciliate, midrib conspicuous within. *Corolla* ½ in. long; lobes oblong or suborbicular. *Nutlets* glochidiate all over, attached rather obliquely to the carpophore, their upper halves free, prominently margined, the rim furnished with stout prickles each being crowned with 5 or 6 small decurved hooks.

Sub-Himalayan tracts of Rohilkhand and N. Oudh. *Flowers* in October and November. *DISTRIB.* W., Cent. and S. India.

### 3. *BOTHRIOSPERMUM*, Bunge; *Fl. Brit. Ind.* iv, 167.

Prostrate or diffuse strigose annual or biennial herbs. *Leaves* alternate, ovate or lanceolate. *Flowers* small, blue or white, axillary, pedicelled, the upper passing into a bracteate raceme. *Calyx* 5-partite; lobes narrow, hardly enlarged in fruit. *Corolla-tube* short, throat with 5 scales; lobes 5, obtuse, spreading, imbricate

in bud. *Stamens* 5, included. *Ovary* deeply 4-lobed; style short, from the base of the lobes, stigma capitate. *Nutlets* 4, ellipsoid, rounded and granular-scabrid on their backs; scar large, near the middle of the inner face, hollow and smooth and with an inflexed margin, carpophore oblong.—Species 4, in N. and Trop. Asia and in the Mascarene Islands.

**B. tenellum**, Fisch. and Mey. Hort. Petrop i, 24; F. B. I. iv, 167. Prain Beng. Pl. 719. *Cynoglossum diffusum*, Roxb. Fl. Ind. i, 457. *C. prostratum* Don Prod. 100.

A weak prostrate or diffuse herb. *Stems* elongate, 6-18 in. long, appressedly hispid. *Leaves* about 1 in. long, ovate-oblong, subacute, entire, softly hairy, the lowest petioled. *Flowers* white, distant, or the upper in close bracteate racemes, pedicels as long as the calyx. *Corolla*  $\frac{1}{2}$  in. across, tube gibbous. *Nutlets* with an elliptic longitudinal scar.

Kheri district of N. Oudh, Gorakhpur, Bundelkhand (Edgeworth). **DISTRIB.** Himalaya eastwards to Bhutan ascending to 3,500 ft.; in Bengal it is common as a weed of cultivation; found also in the Punjab and in the C. Provinces, extending to China, Japan and Polynesia.

## 9. ARNEBIA, Forsk. ; Fl. Brit. Ind. iv, 175.

Annual or perennial erect or diffuse herbs, root often staining red. *Leaves* alternate. *Flowers* subsessile, dimorphic, yellow, violet or whitish, in simple spikes or racemes, or in slightly branching cymes, bracts leaf-like. *Calyx* 5-partite; lobes lanceolate or linear, not or slightly enlarged in fruit. *Corolla-tube* slender, straight, longer than the sepals, throat naked within; lobes 5, imbricate in bud, obtuse, spreading. *Stamens* 5, attached low down on the tube in the long-styled flowers, or in the throat and  $\frac{1}{2}$ -exserted in the short-styled flowers; anthers oblong, obtuse. *Ovary* deeply 4-lobed; style shortly bipartite, stigmas capitate. *Nutlets* 4, ovoid, oblong or acuminate, erect; scar basal, large, triangular, flat, shortly produced upwards along the inner face.—Species 12, in N. Africa and W. and C. Asia.

**A. hispidissima**, DC. Prod. x, 94; F. B. I. iv, 176; Cooke Fl. Bomb. ii. 222. *Lithospermum hispidissimum*, Benth. in Royle Ill. 305.

A diffuse, very hispid, annual or biennial herb. *Stems* 3-15 in. long, branching from a woody base, densely clothed with long, white, stiff, spreading bulbous-based hairs. *Leaves* sessile,  $\frac{1}{2}$ -2 in. long, linear-lanceolate, sub-obtuse, densely hispid on both sides. *Flowers* in compact secund racemes

or spikes; bracts  $\frac{1}{4}$  in. long, linear. *Calyx*  $\frac{1}{2}$  in. long, divided almost to the base, very hispid; segments unequal, lanceolate, acute. *Corolla* yellow, hairy outside, tube  $\frac{1}{2}$  in. long, mouth  $\frac{1}{2}$  in. in diam.; lobes  $\frac{1}{10}$  in. long, oblong, obtuse. *Nutlets* very small, ovoid, acute, tuberculate on all sides.

Abundant locally in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, in sandy soil; also in Bundelkhand. Flowers in March. *DISTRIB.* Common in the Punjab Plain and in Sind, also in W. Tibet ascending to 12,000 ft., extending to Persia, Arabia and Nubia. The root yields a beautiful purple dye which is used in Bombay as a substitute for *Alkanet*.

## LXXVII.—CONVOLVULACEÆ.

Herbs or shrubs, usually twining, rarely trees. *Leaves* alternate, exstipulate (none in *Cuscuta*). *Flowers* regular, 5-merous (sometimes 4-merous in *Cuscuta*), hermaphrodite, often showy, arranged in pedunculate axillary bracteate cymes, rarely solitary. *Calyx* deeply 5-lobed, often persistent and sometimes much enlarged in fruit, segments often unequal and distinct to the base. *Corolla* campanulate or funnel-shaped, rarely subrotate; limb entire, shortly lobed, often plicate in bud. *Stamens* 5, attached to the corolla-tube; anthers linear or oblong, dorsifixed, dehiscing longitudinally. *Ovary* superior, of 2 carpels, rarely more, the base often encircled by an annular or lobed disk; cells as many or (by spurious dissepiments) twice as many as the carpels; style filiform, simple or forked; stigma capitate or 2-lobed, or stigmas 2; ovules usually two in each carpel, sessile, erect, anatropous. *Fruit* a berry or a capsule dehiscing by 2 valves or irregularly. *Seeds* 4-2, rarely solitary, erect; albumen none or scanty; cotyledons generally plicate, obscure or none in *Cuscuta*.—Species about 1,000, in trop. and temp. regions.

Corolla-tube usually uniformly enlarged from the base, the 5 bands on the lobes rarely clearly defined from the intervening spaces, pollen not echinulate.

Yellow parasitic leafless twining herbs . . . 1. *CUSCUTA*.

Green non-parasitic leafy herbs, shrubs or trees.

Fruit indehiscent, style none . . . 2. *ERXACEÆ*.

Fruit dehiscent, or if indehiscent then small and with thin fragile walls, style or styles present.

Flowers in racemes or panicles, outer  
3 or all the sepals enlarged in fruit;  
capsule 1-seeded, indehiscent, rarely  
2-valved . . . . . 3. PORANA.

Flowers in cymes or solitary; capsule  
valvate or opercular, rarely dehiscent  
irregularly.

Styles 2, distinct from the base, sepals  
not or slightly enlarged in fruit.

Corolla-lobes imbricate, flowers  
solitary in the upper axils,  
stamens exserted . . . . . 4. CRESSA.

Corolla-lobes in duplicate-contorted,  
flowers in few-flowered peduncled  
cymes or solitary in the axils,  
stamens included or slightly  
exserted . . . . . 5. EVOLVULUS.

Style entire, stigmas usually 2.

Ovary 1-celled, capsule 4-valved;  
stigmas short, oblong, calyx-lobes  
not enlarged; bracts 2, large,  
enclosing the calyx . . . . . 6. CALYSTEGIA.

Ovary 2- or sometimes 4-celled.

Stigmas elongate.

Stigmas filiform, ovary 2-celled,  
capsule 4-valved or indehi-  
scent, hairs simple or rarely  
2-branched . . . . . 7. CONVOLVULUS.

Stigmas elliptic, ovary 2-celled,  
capsule usually 8-valved,  
hairs 3-many-branched . . . . . 8. JACQUEMONTIA.

Stigmas globose.

Capsule 4-valved, stems not  
winged . . . . . 9. MERREMIA.

Capsule circumscissile above  
the middle, stems winged . . . . . 10. OPERCULINA.

Corolla-tube not uniformly enlarged from the  
base, the five bands on the lobes clearly  
defined by 2 prominent lines, pollen echinu-  
late.

Fruit dehiscent, or if indehiscent then with  
thin fragile walls.

Corolla more or less campanulate, calyx-lobes never aristate, stamens included . 11. IPOMÆA.

Corolla more or less salver-shaped, calyx-lobes usually aristate, stamens exserted . 12. CALONYCTION.

Fruit indehiscent, coriaceous or fleshy.

Fruit woody, corolla salver-shaped, stigmas linear-oblong . . . . . 13. RIVEA.

Fruit mealy or fleshy, corolla funnel-shaped, stigmas globose.

Ovary 4-celled . . . . . 14. ARGYREIA.

Ovary 2-celled . . . . . 15. LETTOMIA.

### 1. CUSCUTA, Linn.; Fl. Brit. Ind. iv, 225.

Leafless twining parasitic herbs, yellow or reddish. *Flowers* in fascicles, small, white or rose-coloured, sessile or shortly pedicelled; bracts none or small. *Sepals* 5 or 4, subequal, distinct or shortly connate at the base. *Corolla* ovoid, globose or campanulate; lobes 5 or 4, short, imbricate, usually with fimbriate or lobed scales near the base or below the stamens. *Stamens* 5 or 4, inserted on or below the throat of the corolla; filaments short, linear; anthers oblong, shortly exserted. *Ovary* more or less completely 2-celled, styles 1 or 2, stigmas 2, ovules 2 in each cell. *Capsule* globose or ovoid, dry or succulent, circumsciss or irregularly bursting. 4-2-seeded. *Seeds* glabrous, albumen fleshy; embryo slender, spiral. Cotyledons none or obscure.—Species about 90, in tropical and temperate regions.

*C. reflexa*, Roxb. Cor. Pl. ii, 3, t. 104; Fl. Ind. i, 446; F. B. I. iv, 225; Watt E. D.; Kanjilal For. Fl. 252; Gamble Man. Ind. Timb. 505; Collett Fl. Siml. 339, fig. 107; Prain Beng. Pl. 723; Cooke Fl. Bomb. ii, 224. *C. anguina*, Edgew.—Vern. Akás-bel. (Dodder.)

*Stems* long, branching, closely twining, glabrous; branches stout, fleshy, forming dense yellow masses on low trees and shrubs. *Flowers* 5-merous, solitary or in clusters or shortly racemose, pedicels short, usually curved, often verrucose, rarely none; bracts small, fleshy, subquadrate. *Calyx* divided almost to the base; segments ovate-obtuse. *Corolla* white, deciduous; tube  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, almost cylindrical; lobes short, triangular, acute, reflexed; scales prominent, attached near the base of the corolla-tube, fimbriate, incurved at the apex. *Style* simple, very short; stigmas large, distinct, diverging. *Capsule*  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., depressed-globose, circumscissile near the base. *Seeds* 2-4, large.



Very common within the area, and often very destructive to small trees and shrubs if left to itself. Flowers Sep.-Feb. **DISTRIB.** Throughout India and up to 8,000 ft. on the Himalaya, extending to Ceylon, Burma, Malaya and China.

*C. anguina* of Edgeworth, which is treated as a variety in the Fl. Brit. India, differs only by having much smaller flowers. Between this and Wallich's *C. grandiflora* Mr. Clarke remarks that the chain of intermediates is nearly complete. The seeds are carminative, and the plant is eaten by cattle and goats. The seeds of *Cuscuta* germinate on the ground, but as soon as they have secured a footing on the host-plant the stem is liberated from the rooting portion and the plant becomes wholly parasitic.

## 2. ERYCIBE, Roxb. ; Fl. Brit. Ind. iv, 180.

Scandent or diffuse shrubs, rarely erect trees, shoots rusty-tomentose. *Leaves* entire, coriaceous. *Flowers* small, in axillary or terminal racemose or panicle cymes; bracts small, lanceolate. *Sepals* subequal, orbicular, coriaceous, adpressed to the base of the fruit. *Corolla* white or yellowish, hairy outside; tube shortly campanulate; limb plicate in bud; lobes imbricate, deeply bifid, the central portion of each thickened. *Stamens* on the throat of the corollae subincluded, filaments short, anthers ovate-lanceolate. *Ovary* globose, 1-celled, 4-ovuled, style none; stigma large, 5-or 10-ridged. *Fruit* an ovoid or ellipsoid 1-seeded berry. *Seed* glabrous; albumen scanty, irregularly intruded between the plicate fleshy cotyledons.—Species about 12, in Asia and trop. Australia.

*E. paniculata*, Roxb. Cor. Pl. ii, 31, t. 159; Fl. Ind. i, 585; Brandis For. Fl. 344; Ind. Trees 483; F. B. I. iv, 180; Watt B. D.; Gamble Man. Ind. Timb. 505; Prain Beng. Pl. 724; Cooke Fl. Bomb. ii, 225.

A large climbing evergreen shrub, or occasionally a small erect tree; branches long, more or less angular, clothed when young with reddish-brown tomentum. *Leaves* 3-5 in. long, elliptic-oblong or obovate-oblong, abruptly acuminate, narrowed towards the base into a short petiole glabrous or nearly so; main lateral nerves 4-6 pairs, arcuate. *Flowers* yellow, in long terminal or (occasionally) axillary panicles, densely rusty-tomentose. *Calyx* clothed outside with reddish-brown tomentum and more or less stellate-pubescent. *Sepals*  $\frac{1}{2}$  in. long, orbicular. *Corolla*  $\frac{1}{2}$  in. long, tube broadly funnel-shaped; lobes 5, bifid, hairy on the back below the division, margins plicate. *Anthers* with a long curved apiculate connective. *Berry*  $\frac{1}{2}$  in. in diam., subglobose or ellipsoid, supported on the persistent calyx, black and pulpy when ripe.

Sub-Himalayan tracts of Pilibhit, Northern Oudh and Gorakhpur, also in Bundelkhand. Flowers May to Nov. **DISTRIB.** From Nepal eastwards ascending to 4,000 ft. on Himalaya, and from Bengal and Central Pro-

vinces to Southern India and Ceylon, extending to Burma, the Nicobar Islands, the Malay Archipelago and Australia. The bark is used in Chota Nagpur as a remedy for cholera.

### 3. FORANA, Burm.; Fl. Brit. Ind. iv, 221.

Large climbers. *Leaves* petioled, entire. *Flowers* white blue or purple, often in large paniced cymes, bracts persistent. *Sepals* in flower small and narrow, in fruit the three outer or all much enlarged, membranous and nerved. *Corolla* campanulate or funnel-shaped; limb plicate, subentire or lobed. *Stamens* subincluded. *Ovary* 2- or 1-celled, 4- or 2-ovuled; style long or short, entire or 2-fid., stigma 2-lobed or with 2 capitate stigmas. *Fruit* small, subglobose, 1-seeded, indehiscent or a 2-valved capsule. *Seed* glabrous, cotyledons plicate.—Species about 10, in India, the Malay Archipelago and North Australia.

Flowers in long pendulous racemes, 3 of the  
sepals enlarged in fruit, limb of corolla,  
shortly lobed . . . . . 1. *P. paniculata*.

Flowers in dichotomous racemes, all the  
sepals enlarged in fruit, limb of corolla  
deeply lobed . . . . . 2. *P. racemosa*.

**1. *P. paniculata*, Roxb.** Cor. Pl. iii, 31, t. 235; Fl. Ind. i, 466; Don Prod. 99; Brandis For. Fl. 342; Ind. Trees 487; F. B. I. iv, 222; Watt E. D.; Kanjilal For. Fl. 251; Gamble Man. Ind. Timb. 507; Prain Beng. Pl. 724; Cooke Fl. Bomb. ii, 227.—Vern. Bel-kamu, safed bel. (Bridal Creeper.)

A large climbing shrub, the branchlets underside of leaves and inflorescence clothed with soft grey tomentum. *Leaves* petioled, 2-4 in. long, ovate-cordate, acuminate, entire, membranous, hairy on both surfaces, basal nerves 5-7. *Flowers* small, pure-white, very numerous, arranged in large axillary and terminal drooping panicles. *Sepals* (in flower)  $\frac{1}{2}$  in. long, linear-oblong; three of them much enlarged in fruit, membranous and strongly reticulate. *Corolla* about  $\frac{1}{4}$  in. long, campanulate, glabrous; limb shortly 5-lobed. *Style* very short. *Capsule*  $\frac{1}{2}$  in. in diam., membranous, brittle, hairy, 1-seeded.

Dehra Dun and Siwalik Range; common eastwards along the Sub-Himalayan tracts, also in Bundelkhand. Flowers October to January. **DISTRIB.** Westward to the Punjab and Mount Abu and eastwards to Bengal and Upper Burma, and on the Himalaya in Kumaon up to 4,000 ft. As a climber it forms when in flower a very beautiful object with its dense masses of white blossom hanging in festoons from the branches. The stems are much used in the Saharanpur district in making baskets for rough work.

*P. racemosa*, Roxb. Hort. Beng. 13; Fl. Ind. i, 466; Don Prod. 93; Royle Ill. 307; F. B. I. iv, 222; Gamble Man. Ind. Timb. 507; Collett Fl. Siml. 339; Brandis Ind. Trees 487.—(Snow-Creeper.)

A climbing shrub, puberulous or nearly glabrous. Leaves petioled, 2-3 in. long, ovate, acute, deeply cordate at the base. Flowers small, white, pedicelled, arranged in lax 2-chotomous racemes; bracts at the forks amplexicaul, leaflike, persistent and scarious in fruit, those on the pedicels linear. Sepals (in flower)  $\frac{1}{2}$  in. long, linear-oblong, puberulous, all five enlarging in fruit, oblong, spatulate, scarious and strongly nerved. Corolla sub-campanulate,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, lobed nearly half-way down, lobes oblong. Style linear; stigmas short, oblong. Capsule  $\frac{1}{2}$  inch long, ellipsoid, apiculate, membranous, glabrous.

Dehra Dun. DISTRIB. Sub-tropical Himalaya from Garhwal eastwards to Bhotan, up to 6,000 feet, and from the Khasia Hills to Burma. A very beautiful plant when in blossom, the white flowers resembling at a distance patches of snow.

#### 4. CRESSA, Linn. ; Fl. Brit. Ind. iv, 225.

Small erect or diffuse branching undershrubs, usually grey-pubescent. Leaves small, entire. Flowers small, sessile in the upper axils or passing into terminal spikes or clusters. Sepals small, thin, imbricate, not enlarging in fruit. Corolla small, funnel-shaped, tube short, lobes subimbricate in bud. Stamen exserted, filaments filiform. Ovary 2-celled, cells 2-ovuled; styles 3, distinct, equal, stigmas capitate. Fruit a 2-4-valved capsule, usually 1-celled. Seeds usually 4 in India plants, glabrous cotyledons linear, plicate.—Species 3, in the warmer regions of the world.

*C. cretica*, Linn. Sp. Pl. 223; F. B. I. iv, 225; Watt E. D.; Prain Beng. Pl. 725; Cooke Fl. Bomb. ii, 229. *C. indica*, Retz.; Roxb. Fl. Ind. ii, 72.

A small erect bush-like annual. Stems 6-18 in. long, slender, much branched. Leaves crowded, sessile  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, densely silky-hairy; lower cordate, upper smaller, ovate or lanceolate. Flowers very shortly pedicelled, white or pink; bracts 2, small, linear, appressed to the calyx. Calyx densely silky; segments  $\frac{1}{2}$  in. long, elliptic, obtuse, concave. Corolla  $\frac{1}{2}$  in. long, divided down to the middle; lobes oblong, reflexed, hairy outside near the apex. Capsule  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, ovoid, pointed, hairy at the apex. Seeds 4.

Found mostly in the western portion of the area, and usually in cultivated ground where the soil is sandy, as in the districts of Muttra, Agra and in Merwara, but nowhere common. DISTRIB. Throughout the hotter parts of India from the Punjab and Calcutta to Ceylon, especially near

the sea, extending to Baluchistan and most warm regions. The Indian plant differs from the common form of *C. cretica* in having the capsule 4-seeded.

### 5. EVOLVULUS, Linn. ; Fl. Brit. Ind. iv, 220.

Small usually silky-pubescent prostrate or erect herbs or undershrubs. *Leaves* small, entire, often distichous. *Flowers* small, white blue or pink, solitary in the axils or in few-flowered peduncled cymes. *Sepals* subequal, not enlarging in fruit. *Corolla* funnel-shaped or subrotate ; limb plicate, subentire. *Stamens* included or exerted, filaments slender. *Ovary* 2- or 1-celled, 4-ovuled ; styles 2, distinct from the base, each cleft into 2 linear or subclavate stigmas. *Capsule* globose, 4- or 2-valved. *Seeds* 4 or 2, rarely solitary, glabrous, cotyledons twice folded.—Species about 70, in tropical and sub-tropical regions of the world.

*E. alsinoides*, Linn. *Roxb. Fl. Ind. ii*, 105, *F. B. I. iv*, 220 ; *Watt E. D.* ; *Collett Fl. Siml.* 338 ; *Prain Beng. Pl.* 725 ; *Cooke Fl. Bomb. ii*, 229. *E. linifolius*, Linn. *E. angustifolius*, *Roxb. Fl. Ind. ii*, 107. *E. hirsutus*, *Lamk.* ; *Roxb. Fl. Ind. ii*, 106.

A much-branched diffuse perennial herb ; annual branches many, spreading from a short woody rootstock, wiry, more or less pilose or sometimes almost glabrous. *Leaves* variable, sessile or nearly so,  $\frac{1}{4}$ -1 in. long, lanceolate to ovate, obtuse, mucronate, acute at the base, densely clothed with appressed white or fulvous silky pubescence. *Flowers* blue or white, on 1-3-flowered filiform peduncles ; bracts small, linear, hirsute, persistent, pedicels filiform. *Calyx* densely silky ; segments  $\frac{1}{2}$  in. long, lanceolate, acute. *Corolla* subrotate,  $\frac{1}{2}$  in. long. *Capsule*  $\frac{1}{8}$ - $\frac{1}{2}$  in. in diam., 4-valved and usually 4-seeded.

Very common in most parts of the area, especially on open sandy ground and by roadsides. *Flowers* July to November. *DISTRIB.* Throughout India and in Ceylon, Himalaya up to 6,000 feet ; also found in nearly all tropical and subtropical regions of the world. The commonest Indian form is the type with leaves  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, oblong or elliptic, moderately silky with white or fulvous hairs. *E. linifolius* has linear leaves up to 1 in. long. *E. hirsutus* has thick leaves densely clothed with fulvous or reddish hairs. The plant is used in Ceylon as a bitter tonic and febrifuge.

### 6. CALYSTEGIA, R. Br. ; Fl. Brit. Ind. iv, 217.

Climbing or prostrate herbs, glabrous or nearly so. *Leaves* entire or lobed. *Flowers* axillary, solitary, rarely in few-flowered cymes ; bracts 2, large, persistent and enclosing the calyx. *Sepals* ovate or

oblong, the two inner rather smaller. *Corolla* funnel-shaped or campanulate, glabrous; limb plicate, subentire. *Stamens* included. *Ovary* 1- or imperfectly 2-celled, 4-ovuled; style entire, filiform, stigma of 2 oblong lobes. *Capsule* ovoid or sub-globose, 1-celled, 4-valved and usually 4-seeded. *Seeds* black, glabrous or verrucose.—Species 8, in temperate and sub-tropical regions, two in Britain.

*C. hederacea*, Wall. 1323; *F. B. I. iv*, 217; *Prain Beng. Pl.* 727.

A prostrate or climbing perennial herb. *Leaves* 1-3 in. long, somewhat irregular in shape, entire or lobed, cordate or sagittate, petioles about 1 in. long. *Flowers* pinkish-purple, peduncled, bracts ovate. *Sepals* 5, glabrous,  $\frac{1}{2}$  in. long. *Corolla* subcampanulate, tube 1 in. long. *Capsule*  $\frac{1}{2}$  in. long, ovoid, subacute, glabrous. *Seeds* glabrous.

Prostrate as a weed of cultivation, or climbing on hedges and bushes. **DISTRIB.** Westwards to the Punjab and Afghanistan, and eastwards to N. and E. Bengal and Penang; extending to China, Japan and Amurland.

## 7. CONVOLVULUS, Linn.; Fl. Brit. Ind. iv, 217.

Herbs or undershrubs, erect prostrate or twining, sometimes spinous. *Leaves* entire toothed or lobed. *Flowers* axillary, solitary or in few-flowered cymes, bracts usually narrow. *Sepals* usually subequal. *Corolla* campanulate or funnel-shaped, limb plicate or nearly entire. *Stamens* included, filaments usually unequal. *Ovary* 2-celled, 4-ovuled, style filiform; stigmes 2, linear or oblong, distinct. *Fruit* a 2-celled capsule, 4-valved or bursting irregularly. *Seeds* normally 4, smooth or minutely tuberculate.—Species about 150, chiefly in temperate or sub-tropical regions.

Branches prostrate or suberect, not twining,

flowers sessile or nearly so, corolla  $\frac{1}{2}$ - $\frac{1}{3}$  in.

long . . . . . 1. *C. pluricaulis*.

Stems trailing or twining, peduncles 1-2 in. long,

corolla  $\frac{2}{3}$ -1 in. long . . . . . 2. *C. arvensis*.

1. *C. pluricaulis*, Chois. *Convol. Or.* 25; *F. B. I. iv*, 218; *Watt E. D.*; *Prain Beng. Pl.* 723.

A diffuse hairy perennial herb with a woody rootstock; branches slender, terete, prostrate or suberect, sparsely fulvous-pilose. *Leaves* shortly petioled, linear-oblong, up to 1½ in. long; the upper ones smaller, linear-oblong, hairy on both sides. *Flowers* solitary or in pairs, sessile or nearly so in the leaf-axils, bracts linear. *Calyx* thinly hairy; sepals subequal, lanceolate to ovate, tips acuminate. *Corolla* pale-rose, shortly funnel-shaped,  $\frac{1}{2}$ - $\frac{1}{3}$  in. long. *Capsule* globose, less than  $\frac{1}{8}$  in. in diam. *Seeds* brown, minutely puberulous.

Common within the area, especially on sandy or rocky ground. **DISTRIB.** Punjab Plain, and eastwards to Behar and Chota Nagpur; found also in Senegal.

**VAR.** *macra* C. B. Clarke in F.B.I. Lc. *Evolvulus pilosus*, Roeb. Fl. Ind. ii 106. A larger and more densely hairy plant. *Leaves* oblong. *Sepals* elliptic-lanceolate, rufous-hirsute. *Corolla*  $\frac{2}{3}$ - $\frac{3}{4}$  in. long.—Common in the Punjab Plain and up to 3,000 ft. in Kashmir, extending eastwards to Rohilkhand.

**2. C. arvensis**, Linn. Sp. Pl. 153; Royle Ill. 208; F. B. I. iv, 219; Watt E. D.; Collett Fl. Siml. 338; Cooke Fl. Bomb. ii, 235. *C. Malcolmii* Roeb. Fl. Ind. i, 474. (Small Bindweed.)

A glabrous or somewhat pubescent herb with a slender creeping root-stock. *Stems* many, trailing or twining, angular. *Leaves* petioled, 1-3 in. long, ovate or oblong-lanceolate, obtuse and apiculate at the apex, entire or (the lower ones) sometimes lobed, base auriculate or hastate; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Peduncles* 1-2 in. long, solitary, slender, with a pair of small linear bracts at the summit from the axils of which the pedicels arise; pedicels up to 1 in. long, each except the primary one 2-bracteolate beyond the middle. *Sepals*  $\frac{1}{2}$  in. long, unequal, broadly elliptic, obtuse and sometimes mucronate, glabrous or nearly so. *Corolla* widely funnel-shaped,  $\frac{3}{4}$ -in. long, pink or white with a pale-yellow centre, glabrous. *Capsule*  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., globose, glabrous. *Seed*, subtrigonus, dark reddish-brown.

Common as a weed of cultivation, especially in the drier western portion of the area. Flowers during the cold season. **DISTRIB.** From Kashmir and the Punjab Plain to the Deccan, Western Himalaya up to 10,000 ft.; also widely distributed in nearly all temperate and subtropical regions of the world. Well-known in Britain as a troublesome agricultural pest.

### 8. JACQUEMONTIA, Choisy.

UNDER CONVULVULUS IN FL. BRIT. IND.

Twining herbs or undershrubs, rarely prostrate. *Leaves* usually cordate, entire or rarely toothed or lobed. *Flowers* in axillary compound umbellate or capitate cymes, rarely solitary, bracts usually small. *Sepals* equal or unequal. *Corolla* small, tubular or funnel-shaped, limb plicate, the vertical bands ending in 2 distinct nerves. *Stamens* included. *Ovary* glabrous, 2-celled, 4-ovuled, style filiform; stigmas 2, linear or elliptic-oblong. *Fruit* a globose, 2-celled usually 8-valved capsule. *Seeds* normally 4, usually glabrous, often with the margins slightly winged.—Species about 60, chiefly in Trop. America.

*J. pauciculata*, Hallicr f. in Engl. Bot. Jahrb. xvi, 541; xviii, 95; Prain Beng. Pl. 728; Cooke Fl. Bomb ii, 235. *Convolvulus parviflorus*, Vahl.; Roxb. Fl. Ind. i, 471; F. B. I. iv, 220; Watt. E. D.

A slender twining pubescent herb. Leaves  $1\frac{1}{2}$ -3 in. long, ovate cordate acute or acuminate, entire, pubescent beneath, nearly glabrous above petioles  $\frac{1}{2}$ -1 in. long, pubescent. Flowers white, peduncles longer than the petioles. Sepals  $\frac{1}{2}$  in. long, ovate, cordate, acuminate, pubescent, not enlarged in fruit. Corolla tubular,  $\frac{1}{2}$  in. long, mouth narrow, limb shortly and acutely 5-lobed. Capsule glabrous,  $\frac{1}{2}$  in. in diam. Seeds slightly tuberculate on the back.

Bundelkhand (Duthie), Saugor (Jerdon). Flowers Oct. and Nov. DISTRIB. Cent. Provinces and Bombay to S. India and Ceylon; also in Assam extending to the Malay Peninsula, N. Australia and Trop. Africa.

### 9. MERREMIA. Dennst.

UNDER IPOMÆA IN FL. BRIT. IND.

Shrubs or herbs usually climbing. Stems rarely winged. Leaves entire lobed or divided. Flowers axillary, usually on long peduncles solitary or in few-flowered (rarely many-flowered) cymes, bracts small. Sepals subequal, elliptic or lanceolate and usually acuminate, convex usually slightly enlarged and thickened in fruit. Corolla funnel-shaped or campanulate, usually white, the 5 vertical bands usually defined by dark violet lines; limb plicate, the margin slightly lobed. Stamens unequal, included or exserted; filaments filiform, anthers usually twisted; pollen usually with longitudinal folds, never spinulose. Ovary 2-4-celled, style filiform; stigmas 2, globose, ovules 4. Fruit a 4-valved capsule, 1-4-celled, the style sometimes separating with a small operculum. Seeds 4, rarely fewer, dull and usually glabrous.—Species about 40, in the warmer regions of the world.

Corolla large, shaggy outside; seeds minutely velvety, margins subvillous. . . . . 1. *M. crispata*.

Corolla under 1 in. long, not shaggy outside.

Buds long, acute; leaves subsessile, oblong-hastate or linear-hastate.

Prostrate but never twining; leaves obtuse truncate or 3-toothed at the apex . . . . . 2. *M. tridentata*.

A twining herb, leaves gradually tapering to the apex . . . . . 3. *M. hastata*.

Buds short, globose; leaves distinctly petioled, not hastate.

Stems twining; leaves ovate, cordate, acute; peduncles distinct, often long, many-flowered; seeds velvety-pubescent 4. *M. chryseides*.

Stems filiform, creeping and rooting at the nodes, not twining; leaves usually reniform, obtuse; peduncles short or none, few-flowered, seeds glabrous. . . . 5. *M. emarginata*.

1. *M. crispatula*, Prain Beng. Pl. 730; *Ipomæa petaloidea*, Chois.; F. B. I. iv, 212.

A large glabrous climber. Leaves 3-5 in. long, ovate or lanceolate, acute rounded or subcordate at the base; upper smaller, narrower, petioles about  $1\frac{1}{2}$  in. long. Flowers, subracemose, on peduncles  $\frac{1}{2}$ -1 in. long, pedicels often up to 1 in. long, bracts caducous. Sepals  $\frac{3}{4}$ -in. long, elliptic-ovate, obtuse or subacute, glabrous. Corolla yellow,  $1\frac{1}{4}$ -in. long, shaggy outside. Capsule  $\frac{1}{2}$  in. long, ovoid. Seeds minutely velvety, margins subvillous.

N. Oudh (R. Thompson, Duthie). Flowers during April and May. DISTRIB. Behar, Chota Nagpur, Orissa and southwards to the Godavari, extending to Lower Burma.

VAR. *pauciflora*, *Ipomæa petaloidea*, var. *pauciflora*, C. B. Clarke in F. B. I. l.c.; Prain Nov. Ind. vii (1894), 99.—Leaves all narrowly oblong-lanceolate. Peduncles 1- rarely 2-flowered. In the Sub-Himalayan tracts of N. Oudh and Gorakhpur (Duthie). Flowers in May. DISTRIB. Kumaon (Dr. T. Thomson), Pegu (Kurz). Upper Burma (Collett).

2. *M. tridentata*, Hallier f. in Engl. Bot. Jahrb. xvi, 552; Prain Beng. Pl. 730; Cooke Fl. Bomb. ii, 237. *Convolvulus tridentatus*, Linn.; Roxb. Fl. Ind. i, 475. *Ipomæa tridentata*, Roth; F. B. I. iv, 205.

A small glabrous perennial herb. Stems many, elongate, not twining, decumbent from a small woody rootstock. Leaves sessile or nearly so,  $\frac{1}{2}$ -1 in. long, linear-hastate oblong-obovate or subquadrate, the apex obtuse truncate or 3-toothed. Peduncles 1-3-flowered, wiry, as long as or longer than the leaves; buds acute; bracts minute, lanceolate; pedicels subclavate. Sepals  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, elliptic, mucronate, glabrous. Corolla funnel-shaped,  $\frac{2}{3}$ - $\frac{1}{2}$  in. long, pale-yellow with a pink eye, limb with shallow lobes. Capsule  $\frac{1}{8}$  in. in diam., ovoid, glabrous, 2-celled. Seeds dark, glabrous.

Bundelkhand (Edgeworth, Duthie). Flowers Oct. to Dec. DISTRIB. Bengal and Central Provinces to S. India and Ceylon; extending to the Malay Peninsula, Trop. Africa and Madagascar.

3. *M. hastata*, Hallier f. in Engl. Bot. Jahrb. xvi, 552; Prain Beng. Pl. 730; Cooke Fl. Bomb. ii, 238; *Ipomæa angustifolia*, Clarke in F. B. I. iv, 205 (not of Jacq., nor of Chois.). *I. filicaulis*, Bl.; Royle Ill. 207; *Convolvulus medius*, Roxb. Fl. Ind. i, 474.

A diffuse twining biennial herb. Stems angular. Leaves subsessile, 2-3 in. long, hastate-oblong or hastate-linear, tapering gradually to the



apex, basal lobes coarsely dentate. *Flowers* 1-3, on slender peduncles as long as or longer than the leaves; buds acute, bracts minute, pedicels subclavate. *Sepals*  $\frac{3}{4}$ - $\frac{1}{2}$  in. long, narrowly lanceolate, with acuminate recurved tips, glabrous. *Corolla* funnel-shaped,  $\frac{3}{4}$  in. long, pale-yellow, with a purple or reddish eye, limb with shallow lobes. *Capsule* 2-celled,  $\frac{1}{4}$  in. in diam., ovoid, glabrous, surrounded by the slightly enlarged sepals. *Seeds* glabrous.

Bundelkhand (Edgeworth). *Flowers* Aug. to Dec. *DISTRIB.* Khasia Hills, Orissa, Bombay and southwards to Ceylon; extending to China, the Malay Peninsula, Australia and Trop. Africa.

4. *M. chrysoides*, Hallier f. in *Engl. Bot. Jahrb.* xvi, 552; Prain *Beng. Pl.* 730; Cooke *Fl. Bomb.* ii, 238. *Ipomœa chrysoides*, Ker-Gawl.; F. B. I. iv, 206; Collett *Fl. Siml.* 337. *Convolvulus dentatus*, Vahl; Roxb. *Fl. Ind.* i, 477.

An annual or perennial herb, twining or procumbent. *Stems* filiform, branching, glabrous, or sometimes rough with prominent tubercles. *Leaves* 1-3 in. long, ovate, acute, apiculate, often 3-lobed, entire or toothed, glabrous, base deeply cordate, with rounded lobes, petioles slender, 1-2 in. long, often muriculate. *Flowers* small, in dense axillary cymes; buds short, obtuse, peduncles  $\frac{1}{2}$ -3-in. long; bracts minute, caducous, pedicels short. *Sepals*  $\frac{1}{2}$ -in. long, oblong, truncate, apiculate or obscurely toothed, glabrous, reflexed in fruit. *Corolla* campanulate or funnel-shaped, yellow,  $\frac{1}{2}$ -in. long, limb with triangular lobes, bands distinctly striate. *Stamens* slightly exserted. *Capsule*  $\frac{1}{2}$ -in. long, ovoid or subquadrangular, 2-celled, glabrous, transversely wrinkled. *Seeds* trigonous, velvety-tomentose.

Moradabad (T. Thomson), Pilibhit dist. (Duthie). *Flowers* Oct. and Nov. *DISTRIB.* Himalaya up to 4,000 ft., Bengal, Bombay and southwards to Southern India and Ceylon; extending to Burma, China, Malaya, Australia and Trop. Africa.

5. *M. emarginata*, Hallier f. in *Engl. Bot. Jahrb.* xvi., 552; Prain *Beng. Pl.* 730; Cooke *Fl. Bomb.* ii, 236; *Convolvulus reniformis*, Roxb.; *Fl. Ind.* i, 431. *Ipomœa reniformis*, Choisy; F. B. I. iv, 206; Watt *E. D.*

A prostrate creeping herb. *Stems* cord-like, rooting at the nodes, glabrous or softly pubescent. *Leaves*  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. broad, reniform or ovate-cordate, obtuse, crenate-toothed, glabrous, often purplish or rust-coloured, petioles  $\frac{1}{2}$ -1 in. long. *Flowers*, yellow, solitary or 2-3 together on a short peduncle; buds short, globose, bracts inconspicuous, pedicels short. *Sepals* slightly hairy on the back, the margins ciliate; the 2 outer sepals  $\frac{1}{2}$ -in. long, ovate, mucronate; 3 inner longer, subquadrate, 2-lobed. *Corolla* campanulate,  $\frac{1}{2}$ -in. long; lobes 5, acute. *Capsule* 2-celled,  $\frac{1}{2}$ -in. in diam.; surrounded by the slightly enlarged ciliate sepals. *Seeds* 2-4, brown, glabrous.

Bundelkhand (Edgeworth). Flowers Sep. and Oct. **DISTRIB.** Bengal Bombay and southwards to Ceylon, also in Upper Burma and Trop. Africa. Roxburgh remarks that the flowers open late in the forenoon and close early in the evening. The juice of this plant is used medicinally and the plant is sometimes eaten as a pot-herb.

*M. dissecta*, Hallier f.; Cooke *Fl. Bomb.* ii, 241. *Ipomœa sinuata*, Ortega; *F. B. I.* iv, 214.—This is a native of Trop. America and of the West Indies, is becoming naturalized in India, and occurs within the area of this flora as a garden escape. *Stems* twining, usually hirsute. *Leaves* palmately 7-partite, the lobes toothed or sub-pinnatifid. *Corolla* white or pinkish with the throat purple, the bands distinctly lineate.

*M. pentaphylla*, Hallier f.; Cooke *Fl. Bomb.* ii, 239. *Ipomœa pentaphylla*, Jacq.; *F. B. I.* iv, 202. *Batatas pentaphylla*, Choisy; Royle *Ill.* 207.—A twining annual with digitate leaves and large white or yellowish flowers. Found in Western and Northern India, also in Africa and Trop. America; often cultivated.

#### 10. OPERCULINA, Manso.

##### UNDER IPOMÆA IN FL. BRIT. IND.

Large climbing herbs, stems petioles and peduncles winged. *Leaves* large, entire or lobed, rarely peltate. *Flowers* large, axillary, solitary or in few-flowered cymes. *Sepals* large, glabrous, enlarging and thickening in fruit, at length splitting irregularly from the lip. *Corolla* funnel-shaped, rarely campanulate, tube with 5 vertical smooth bands. *Stamens* with filiform filaments; anthers large, at length contorted, pollen not spinulose. *Ovary* 2-celled, 4-ovuled, glabrous, style filiform, stigmas 2, globose. *Fruit* a capsule, the epicarp splitting transversely above the middle, the cap carrying away the style, endocarp at length bursting irregularly. *Seeds* large, usually solitary, black, smooth.—Species about 10, mostly in tropical countries.

*O. Turpethum*, Manso; Prain *Beng. Pl.* 731; Cooke *Fl. Bomb.* ii, 240. *Convolvulus Turpethum*, Linn.; Roxb.; *Fl. Ind.* i, 476. *Ipomœa Turpethum*, R. Br.; Royle *Ill.* 308; *F. B. I.* iv, 212; Watt *E. D.* Merremia *Turpethum*, Rendle in *Fl. Trop. Afr.* iv, Sect. 2, 102. (Indian Jalap.)

A stout softly pubescent twining perennial herb. *Stems* with milky juice, very long, more or less compressed, angled and winged. *Leaves* 2-5 in. long, ovate or oblong, subacute, mucronate, base cordate or truncate, pubescent on both surfaces especially when young; petioles  $\frac{1}{2}$ -2 in., pubescent. *Cymes* few-flowered; peduncles 1-2 in. long, stout; bracts up to 1 in. long, oblong or lanceolate, pubescent, caducous, often

pinkish; pedicels  $\frac{1}{4}$ -1 in. long, stout, pubescent. *Outer sepals* (in flower) about  $\frac{1}{2}$  in. long, ovate, mucronate, pubescent, much enlarged in fruit, orbicular, concave, scarious; the 3 inner sepals smaller, membranous, apiculate, glabrous. *Corolla* white,  $1\frac{1}{2}$ -2 in. long. *Capsule*  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., globose, enclosed in the enlarged imbricate brittle calyx-segments. *Seeds* round, black, one in each cell.

Moradabad (T. Thomson), Dehra Dun (Gamble), Kheri dist. of N. Oudh. (Duthie), Bundelkhand (Edgeworth). Flowers Oct. to Jan. **DISTRIB.** Bengal, Bombay and Deccan and southwards to Southern India and Ceylon; extending to China, the Malay Islands, Australia Philippines, and to Trop. Africa and America. The root, known as *Turpeth-root*, is largely used as a purgative. Cattle do not eat this plant. The flowers are sacred to Siva.

11. *IPOMÆA*, Linn; Fl. Brit. Ind. iv, 196 (in part).

Twining or prostrate herbs, rarely shrubby or erect. *Leaves* entire lobed or divided. *Flowers* axillary, solitary or in cymes. *Sepal* ovate or linear, equal or unequal. *Corolla* campanulate or funnels shaped; limb plicate, slightly lobed. *Stamens* usually included, filaments filiform or dilated below, often unequal, anthers straight or contorted, pollen spinulose. *Ovary* 1-3 (rarely 4)-celled, usually 4-ovuled, style filiform, stigma capitate, entire or 2-3-globose, rarely stigmas 2-linear. *Fruit* a 4-6-valved capsule, rarely indehiscent. *Seeds* usually 4 or 6, glabrous bearded or uniformly velvety or woolly.—Species about 400, in the warmer regions of the world.

Leaves entire (occasionally 3-lobed in *I. pilosa*)

Outer sepals sagittate or cordate at the base 1. *I. calycina*.

Outer sepals not cordate at the base.

Sepals much enlarged in fruit . . . . . 2. *I. barlerioides*.

Sepals not or slightly enlarged in fruit.

Flowers in sessile or nearly sessile heads.

Leaves ovate, acute, capsule hairy;  
seeds glabrous, minutely foveolate . . . . . 3. *I. hispida*.

Leaves oblong-hastate, acute or acuminate, capsule glabrous, seeds velvety . . . . . 4. *I. sindica*.

Flowers in pedunculate cymes or panicles.

Sepals hispid.

Stems prostrate; leaves as broad as long, very obtuse . . . . . 5. *I. rumicifolia*.

Stems twining, leaves acute or acuminate . . . . . 6. *I. pilosa*.

Sepals glabrous.

An aquatic plant, stems trailing in mud or floating . . . . . 7. *I. reptans*.

Terrestrial plants.

Two outer sepals shorter than the inner, corolla  $1\frac{1}{2}$  in. long or more . . . . . 8. *I. sepiaria*.

Sepals subequal, corolla  $\frac{3}{4}$ -1 in. long . . . . . 9. *I. obscura*.

Leaves lobed, (occasionally entire in *I. pestigridis*).

Aprostrate glabrous herb, leaves digitately or the upper sometimes pedately 3-7-partite; corolla white, less than 1 in. long . . . . . 10. *I. dissecta*.

Twining herbs.

Flowers in lax usually subumbellate cymes, not surrounded by large persistent bracts, sepals with long ligulate tips; corolla light-blue tinged with pink or orange-coloured below, over  $1\frac{1}{2}$  in. long . . . . . 11. *I. hederacea*.

Flowers in dense long-peduncled heads, surrounded by large persistent outer bracts; corolla white or pale-pink, under  $1\frac{1}{2}$  in. long . . . . . 12. *I. pestigridis*.

***I. I. calycina***, Clarke in *F. B. I. iv*, 201; Prain Beng. Pl. 734; Cooke *Fl. Bomb. ii*, 242. *Convolvulus calycinus*, Roxb.; *Fl. Ind. i*, 471.

A twining herb with villous stems. Leaves 2-3 in. long, ovate, acuminate, entire, sparsely hairy or nearly glabrous; base cordate, with a wider sinus; petiole slender,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, villous. Flowers 1-3 together; peduncles and pedicels about  $\frac{3}{4}$  in. long, pedicels in fruit deflexed, bracts  $\frac{1}{4}$  in. long, ovate-cordate, acute. Sepals in flower  $\frac{1}{4}$  in. long, unequal, ciliate; the outer ones (in fruit)  $\frac{1}{2}$  in. long lanceolate-sagittate with obtuse lobes; inner linear-lanceolate. Corolla scarcely 1 in. long tubular, white. Capsule  $\frac{1}{4}$  in. long, ovoid, pointed, deflexed, glabrous. Seeds villous, the margins fringed with long white silky hairs.

Jumna ravines near Agra (Duthie), Bundelkhand (Edgeworth), Merwara (Duthie). Flowers October. DISTRIB. W. Himalaya (Royle), Behar, Chota Nagpur and the Deccan; also in Trop. Africa and Formosa.

***2. I. barlerioides***, Clarke in *F. B. I. iv*, 201; Prain Beng. Pl. 734; Cooke *Fl. Bomb. ii*, 243. *Aniseia barlerioides*, Choisy; Royle *Ill.* 207.

A hairy twining perennial herb. Leaves 1-3 in. long, ovate-oblong, sub-acute, often mucronate, hairy on both sides, base cordate or rounded;

petioles densely hairy, up to  $\frac{3}{4}$  in. long. *Flowers* solitary, peduncles longer or shorter than petioles; bracts 2, at the base of the short pedicel,  $\frac{1}{2}$  in. long, linear-lanceolate. *Sepals* densely villous, the 3 outer  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovate or lanceolate, acute; the 2 inner linear, acute and smaller, all enlarged in fruit. *Corolla* purple, funnel-shaped, 2-3 $\frac{1}{2}$  in. long, hairy outside, tube narrowed to the base; limb subentire, plicate. *Capsule*  $\frac{1}{2}$  in. long, ovoid, glabrous. *Seeds* oblong, hairy.

Sub-Himalayan tracts of N. Oudh and Gorakhpur (R. Thompson and Duthie), W. Himalaya up to 5,000 ft., and from Chota Nagpur southwards to Bombay and Southern India; also in Upper Burma.

**3. *I. hispida*, R. & S. Syst. iv, 233; Prain Beng. Pl. 734. I. eri. ocarpa, R. Br.; F. B. I. iv, 204; Watt E. D.; Collett Fl. Siml. 336; Cooke Fl. Bomb. i, 243. Convolvulus sphærocephalus, Rowb. Fl. Ind. i, 472.**

A; twining annual. *Stems* slender, clothed with appressed or spreading hairs. *Leaves* 2-3 in. long, ovate or oblong, acute, hairy on both surfaces and along the margins, base cordate and with rounded lobes; petiole about 1 in. long, densely clothed with reflexed hairs. *Flowers* 2-3 in. long, in subsessile heads, rarely solitary or more than three in a head; bracts small, linear, pedicels very short or none. *Sepals* nearly as long as the corolla, hairy, not or hardly enlarged in fruit, ovate, acuminate. *Corolla* campanulate, pink,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, the upper portion hairy and with small tufts of hairs on the tips of the small acute lobes. *Ovary* very hairy. *Capsule*  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., globose, 2-celled, hairy. *Seeds* minutely foveolate.

Dehra Dun, Rohilkhand, Bundelkhand (Edgeworth). *Flowers* September and October. *DISTRIB.* Punjab to Afghanistan, and throughout India and in Ceylon, up to 4,000 ft. on the Himalaya; also in Burma and generally throughout the tropics of the Old World. The leaves and stems are often eaten as a vegetable.

**4. *I. sindica*, Stapf. in Kew Bull. (1894) 346; Cooke Fl. Bomb. ii, 244.**

Annual. *Stems* many from the base, prostrate, slender, hispid. *Leaves*  $\frac{3}{4}$ -2 $\frac{1}{2}$  in. long, narrowly triangular-hastate, acute or acuminate, hairy on both sides or nearly glabrous above, basal lobes diverging, obtuse; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  the length of blade, rather hispid. *Flowers* solitary or in few-flowered cymes, peduncles and pedicels very short; bracts shorter than the calyx, linear or linear-subulate, hispid. *Sepals*  $\frac{1}{6}$ - $\frac{1}{4}$  in. long, lanceolate, hispid, somewhat enlarged in fruit. *Corolla*  $\frac{1}{3}$  in. long, funnel-shaped; limb broadly 5-lobed, minutely pilose outside and at the tips of the lobes. *Capsule*  $\frac{1}{5}$ - $\frac{1}{4}$  in. long, subglobose, glabrous. *Seeds* black, thinly grey-velvety.

Etawah district (Duthie). *Flowers* October. *DISTRIB.* Westwards to Sirhind, Multan and Sind. This species much resembles *I. hispida* which latter differs, however, by its larger flower-heads and bracts, its hairy capsules and glabrous seeds.

5. *I. rumicifolia*, Chois. *Convol. Or.* 447; *F. B. I.* iv, 207; *Cooke Fl. Bomb.* ii, 244.

An annual usually prostrate herb, sparsely pubescent. *Leaves* 1-2 in. long, ovate-oblong hastate or subreniform, obtuse, apiculate or emarginate, entire or somewhat angular or lobulate, glabrous; base cordate, with a wide sinus and rounded lobes, petioles  $1\frac{1}{2}$ -2 in. long. *Peduncles* short, laxly few-flowered; bracts  $\frac{1}{2}$  in. long, linear, hairy, subpersistent, pedicels  $\frac{1}{2}$  in. long, thickened in fruit. *Sepals*  $\frac{1}{2}$  in. long, ovate, acute, clothed with spreading bulbous-based hairs, ciliate on the margins. *Corolla* tubular-campanulate,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, glabrous. *Capsule*  $\frac{1}{2}$  in. long, ovoid, apiculate, glabrous, veined. *Seeds* usually 4, velvety.

Kheri district of N. Oudh (Duthie). Flowers December. *DISTRIB.* Punjab at Hissar, also in Sind and in Southern India, extending to Trop. Africa.

6. *I. pilosa*, *Sweet Hort. Brit. ed.* ii, 372; *F. B. I.* iv, 213; *Collett Fl. Siml.* 336; *Prair Beng. Pl.* 734; *Cooke Fl. Bomb.* ii, 244. *Convolvulus pilosus*, *Roxb.*; *Fl. Ind.* i, 473.

An annual twining herb. *Stems* pilose with gland-based hairs. *Leaves* 2-5 in. long, broadly ovate, acute or acuminate, entire or deeply 3-lobed, hairy above, white-woolly beneath, base cordate, petioles 2 in. or more. *Flowers* in lax racemose bracteate cymes, peduncles 1-3 in. long, bracts about  $\frac{1}{2}$  in. long, linear-lanceolate, subpersistent, pedicels  $\frac{1}{2}$  in. long. *Sepals*  $\frac{1}{2}$  in. or more, narrowly lanceolate, acuminate, very hairy and with ciliate margins. *Corolla* purple, narrowly funnel-shaped, about  $\frac{1}{2}$  in. long, limb acutely lobed. *Capsule*  $\frac{1}{2}$  in. in diam., subglobose, slightly hairy towards the apex. *Seeds* velvety pubescent and pilose.

Dehra Dun (Duthie) and in the districts of Saharanpur and Agra and in Bundelkhand (Edgeworth). *DISTRIB.* From the Western Himalaya to Bengal, also in the Punjab, Sind and in Southern India, extending to Trop. Africa.

7. *I. reptans*. *Poir. Encyc. Suppl.* iii, 460; *Royle Ill.* 307; *Prair Beng. Pl.* 736. *I. aquatica*, *Forsk. Fl. Egypt.-Arab.* 44; *F. B. I.* iv, 210; *Watt E. D.*; *Cooke Fl. Bomb.* ii, 246. *Convolvulus repens*, *Willd.*; *Roxb. Fl. Ind.* i, 482.—*Vern. Kalmi*.

An annual or biennial aquatic herb. *Stems* elongate, trailing on mud and rooting at the nodes or floating, thick, hollow, glabrous. *Leaves* 2-6 in. long, elliptic-oblong or subdeltoid, often very narrow, acute, cordate or hastate at the base, rarely truncate, glabrous, petioles 1-5 in. long. *Peduncles* up to about 4 in. long, 1-5 flowered, bracts very small, pedicels 1-2 in. long. *Sepals*  $\frac{1}{2}$  in. long, subequal, oblong-lanceolate, subacute, membranous, glabrous. *Corolla* glabrous, 2 in. long, funnel-shaped, with a pale rose-coloured limb, the throat and tube dull-purple. *Filaments* unequal, woolly below. *Capsule*  $\frac{1}{2}$  in. long, ovoid, glabrous. *Seeds* minutely hairy.

In most parts of the area; very common in ponds, ditches and in moist ground. Flowers during the cold season. **DISTRIB.** Throughout India and in Ceylon, extending to China, the Malay Pen., Trop. Africa and N. Australia. The young shoots and roots are eaten as a vegetable and the plant is often cultivated in S. India and Ceylon. The juice, when dried, is used as a purgative.

**8. I. seplaria**, Kœnig in Roxb. Hort. Beng. 14; Fl. Ind. i, 499; F. B. I. iv, 209; Watt E. D.; Prain Beng. Pl. 736; Cooke Fl. Bomb. ii, 246.

A perennial herb, glabrous or more or less hairy. Stems slender, twining. Leaves 1-3 in. long, ovate, acute, entire, base cordate, with a wide sinus and rounded lobes, petioles 1-2 in. long. Flowers many, in umbelliform long-peduncled cymes, peduncles 1-6 in. long; bracts small, caducous, pedicels clavate in fruit. Sepals about  $\frac{1}{4}$  in. long, ovate, glabrous or slightly hairy, margins membranous, 2 outer rather shorter than the inner. Corolla narrowly funnel-shaped pink or white with a purplish centre, about  $1\frac{1}{2}$  in. long, or more, limb suddenly widened at the mouth; lobes acute, shortly apiculate. Filaments hairy at the base. Capsule  $\frac{1}{2}$  in. long, ovoid, glabrous. Seeds 4 or 2, clothed with grey silky hairs.

Common within the area, and often found in hedges. Flowers Aug. to Oct. **DISTRIB.** Throughout India and in Ceylon; also in Malaya, Hainan and Formosa. It is sometimes eaten as a pot-herb.

**9. I. obscura**, Ker-Gawl. in Bot. Reg. t, 239; F. B. I. iv, 207; Watt E. D.; Prain Beng. Pl. 736; Cooke Fl. Bomb. ii, 248. Convolvulus obscurus, Linn.; Roxb. Fl. Ind. i, 472.

Annual. Stems long, slender, twining, glabrous or slightly villous, often tinged with purple. Leaves 1-2 $\frac{1}{2}$  in. long, broadly ovate, cordate, acute or acuminate, entire, thin, glabrous, petioles 1-3 in. long. Peduncles 1 or 2-3-flowered, about as long as the leaves, bracts minute, pedicels clavate. Sepals about  $\frac{2}{3}$  in. long, nearly equal, ovate or oblong, subacute or obtuse, minutely verrucose. Corolla funnel-shaped,  $\frac{3}{4}$ -1 in. long, yellow, or white with yellow bands, base purple, mouth of limb 1 in. in diam., with shallow lobes. Capsule 2-valved,  $\frac{1}{2}$  in. long, ovoid, subacute, glabrous. Seeds dark-brown, velvety.

All parts of the area, common. Flowers during the greater part of the year. **DISTRIB.** Throughout India and in Ceylon, also in Burma and the Andamans, extending to N. Australia, trop. Africa and the Mascarene Islands.

**10. I. dissecta**, Willd. Phytogr. 5, t. 2, fig. 3; F. B. I. iv, 200; Cooke Fl. Bomb. ii, 249. I. coptica Roth; Royle Ill. 307. Convolvulus copticus Linn.; Roxb. Fl. Ind. i, 477.

A glabrous prostrate herb, rarely twining; branches many,  $\frac{1}{2}$ -2 ft. long, slender, angular. Leaves 1-1 $\frac{1}{2}$  in. in diam., digitate or the upper often pedate; lobes 3-7, linear-lanceolate, irregularly serrate; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, with stipule-like leaves in the axils. Flowers usually solitary,

peduncles  $\frac{1}{2}$ -1½ in. long; bracts near the flower, minute, lanceolate, acute, or with the flowers subsessile amongst leaf-like pectinate bracts. *Sepals*  $\frac{1}{2}$  in. long, oblong-lanceolate, recurved at the cuspidate apex, usually muriculate on the back. *Corolla* white,  $\frac{1}{2}$ -1 in. long, narrowly funnel-shaped, glabrous, lobes acute. *Ovary* 3-celled. *Capsule*  $\frac{1}{4}$  in. in diam., subglobose, 3- or 6-valved. *Seeds* usually 3.

In the districts of Delhi (Royle), Agra, Dholpur (J. R. Drummond) and Aligarh (Duthie), not common. **DISTRIB.** S. India and in Ceylon extending to Upper Burma, Hongkong, Trop. Africa and Australia.

11. *I. hederacea*, Jacq. *Collect. i*, 124; *F. B. I. iv*, 199; *Watt E. D. Collett Fl. Siml.* 336; *Cooke Fl. Bomb. ii*, 252. *I. cœrulea*, Kæn.; *Roxb. Fl. Ind. i*, 501; *Royle Ill.* 308. *I. Nil*, Roth; *Royle Ill.* 307; *Prair Beng. Pl.* 734.—Vern: Nilkalmi.

An annual. *Stems* twining, sparsely retrorsely hairy. *Leaves* 2-5 in. in diam., ovate-cordate, more or less deeply 3-lobed; lobes ovate, acuminate, petioles 1-4 in. long. *Peduncles* 1-5-flowered, usually shorter than the petioles; bracts  $\frac{1}{2}$  in., linear, close to the calyx, pedicels  $\frac{1}{4}$  in. long. *Sepals*  $\frac{1}{2}$ -1 in. long, subequal, narrowly linear upwards, more or less hirsute near the base. *Corolla* 1½-2 in. long, tubular-funnel-shaped, blue tinged with pink, or somewhat orange-coloured below, glabrous outside. *Ovary* 3-celled. *Capsule*  $\frac{1}{2}$  in. in diam., 3-celled, 6-ovuled, subglobose or ovoid, glabrous. *Seeds* 6 or 4, glabrous.

Abundant within the area, but not truly wild. **DISTRIB.** Throughout India both cultivated and apparently wild, ascending to 6,000 ft. on the Himalaya; also in all tropical and sub-tropical regions of the world, but believed to be of American origin. The seeds known as *kaladana* are used as a purgative.

12. *I. pes-tigridis*, Linn. *Sp. Pl.* 162; *Roxb. Fl. Ind. i*, 503; *F. B. I. iv.* 204; *Watt E. D.*; *Prair Beng. Pl.* 734; *Cooke Fl. Bomb. ii*, 250.

A diffuse or twining pubescent herb. *Stems* clothed with long spreading hairs. *Leaves* fulvous-hairy on both surfaces, more or less deeply palmately 5-9-lobed, sometimes 3-lobed or occasionally entire, 1-5 in. long and about as broad; lobes elliptic, acuminate; petioles 1-3 in. long. *Flowers* 3 or more together in peduncled heads; peduncles 1-3 in., densely hairy; outer bracts nearly 1 in. long, longer and broader than the inner, sometimes cordate at the base. *Sepals*  $\frac{1}{2}$ -1 in. long, lanceolate, acute, fulvous-hirsute and ciliate, the 2 outer broader. *Corolla* white or pink, funnel-shaped, about 1 in. long. *Capsule* concealed in the calyx,  $\frac{1}{4}$ -1 in. in diam., ovoid, glabrous, papery. *Seeds* minutely grey-velvety.

A common weed in all parts of the area, climbing on hedges and bushes. *Flowers* in Sep. and Oct. **DISTRIB.** Throughout the greater part of India and in Ceylon; extending to Upper Burma, China, the Malay Pen. and Islands, Polynesia and Trop. Africa. The plant is said to be used medicinally.



The following are the more important species of *Ipomœa* which are cultivated within the area of this flora, or are occasionally met with as garden-escapes:—

*Ipomœa Batatas*, Lamk. *F. B. I.* iv, 202; Duthie and Fuller *Field and Garden Crops N.-W. Prov. and Oudh*; Watt *E. D.*; Prain *Beng. Pl.* 735; Cooke *Fl. Bomb.* ii, 251. *Convolvulus Batatas*, Linn.; DC. *l'Orig. Pl. Cult.* 42. *Batatas edulis*, Choisy.; Royle *III.* 207.—Vern. *Ratalu*, *mitha-ālu*, for the sake of *shakarkand-ālu* (The sweet Potato).—Largely cultivated within the area the tuberous roots which are eaten as a vegetable. There are two forms, one with red and the other with white tubers. The plant is hardly ever seen in flower and still more rarely in fruit. It is widely cultivated in the tropical and sub-tropical regions of both hemispheres. It is believed to be a native of Trop. America.

*Ipomœa Jalapa*, Pursh.. *I* (*Exogonium*) *Purga*, Hayne. (*Jalap*). The turnip-like roots contain a resin which has valuable purgative properties. The plant has been experimentally cultivated in the hilly districts of Northern and Southern India with a view to supplying the drug locally. It is a native of Mexico.

*Ipomœa Leari*, Paxt. A very handsome perennial climber with dark-blue flowers, which turn red when fading. It is much grown within the area as a trellis-plant, and was introduced into India probably from Temp. S. America.

*Ipomœa pulchella*, Roth; Prain *Beng. Pl.* 737. *I. palmata*, *F. B. I.* iv, 210 (in part). *Convolvulus digitatus*, Roxb. *Fl. Ind.* i, 479. This species is universally cultivated in the gardens of N. India, where it is very hardy. It is usually known by the name of the "Railway creeper," on account of its frequent use as the principal decorative plant at many railway stations. It is a perennial climber with glabrous palmately 5-lobed leaves and pale-purple campanulate flowers. It is supposed to be wild in W. and S. India and in Ceylon, and is cultivated in many tropical countries.

*Ipomœa dasysperma*, Jacq.; *F. B. I.* iv, 215. A glabrous twinor with pedately divided leaves, and the flowers are buff-coloured with a purple centre. Clarke in *F. B. I.* l.c. regarded it as a cultivated variety of *I. pulchella*. It is said, however, to be wild in Nubia and Abyssinia.

*Ipomœa purpurea*, Roth; *F. B. I.* iv, 200; Collett *Fl. Siml.* 336; Prain *Beng. Pl.* 735; Cooke *Fl. Bomb.* ii, 252 (*Morning Glory*).—A hairy twinor with entire leaves and large handsome flowers varying in colour from white to dark-purple. Within the area of this flora it is met with only in gardens. It is abundant and apparently wild on the Himalaya from Kashmir to Sikkim up to 7,000 feet. It somewhat resembles *I. hederacea* at first sight, but may be distinguished by its smaller and entire leaves and by the sepals not having long ligulate tips. It is cultivated in all warm countries, and was probably introduced into India from Trop. America.

*Ipomœa tricolor*, Cav.; Prain *Beng. Pl.* 736. *I. rubro-cœrulea*, Hook.; Cooke *Fl. Bomb.* ii, 252.—An annual climber with large handsome blue or white

flowers. It is largely used to form a screen on trellis-work. It is a Mexican species of rather recent introduction into India.

## 12. CALONYCTION, Choisy.

### UNDER IPOMÆA IN FL. BRIT. IND.

Large herbaceous climbers; stems usually muricate. *Leaves* large, cordate, entire or angled. *Flowers* solitary or in few-flowered axillary cymes, bracts caducous. *Sepals* herbaceous, smooth, usually aristate, subequal or the outer smaller. *Corolla* large, salver-shaped, white or rose-purple, glabrous; tube narrow, much longer than the calyx, limb plicate. *Stamens* exserted. *Ovary* 2-celled and 4-ovuled, style filiform, stigma 2-globose. *Fruit* a 4-valved capsule. *Seeds* 4, dull, glabrous.—Species 6 or 7, in Trop. America, two of which are subspontaneous throughout the tropics.

Corolla white, stamens exserted, seeds yellow 1. *C. Bona-nor*.

Corolla rose-purple, stamens included, seeds black . . . . . 2. *C. muricatum*.

1. *C. Bona-nor*, Boj. Hort. Maurit. 227; Prain Beng. Pl. 738. *C. speciosum*, Choisy; Cooke Fl. Bomb. ii. 252 *Ipomæa grandiflora*, Roxb. Fl. Ind. i. 497; (not of Lamk) *I. Bona-nor*, var. *grandiflora* F. B. I. iv, 197; Watt. E. D.; Kanjilal For. Fl. 252; Gamble Man. Ind. Timb. 507. (Moon flower.)

A large scandent twiner. *Stems* often muricate or almost prickly. *Leaves* 3-7 in. long, broadly ovate, acute entire or occasionally lobed, glabrous, thin, base deeply cordate and with rounded auricles, petioles about as long as the leaves. *Peduncles* 2-6 in. long, 1-5 flowered; pedicels short, stout. *Sepals*  $\frac{1}{2}$  in. long, ovate, the 3 outer ones abruptly aristate. *Corolla* white with sometimes greenish bands; tube linear, 3-3 $\frac{1}{2}$  in. long, glabrous within, limb 3-5 in. across. *Stamens* exserted. *Capsule* ovoid-oblong, about 1 in. long, narrowed upwards. *Seeds*  $\frac{1}{2}$  in long, glabrous, polished, yellow.

Apparently wild in many places within the area, but found chiefly near habitations. The flowers expand in the evening and close to wither on the following morning. *DISTRIB.* Throughout the warmer parts of India, also in Ceylon, extending to all tropical countries and often cultivated. All parts of the plant are used medicinally.

2. *C. muricatum*, G. Don Gen. Syst. iv, 264, Prain Beng. Pl. 733; Cooke Fl. Bomb. ii. 253. *Ipomæa muricata*, Jacq.; Roxb. Fl. Ind. i, 499; F. B. I. iv, 197; Watt E. D.; Collett Fl. Siml. 336.

A climbing twiner. *Stems* often muricate. *Leaves* 3-6 in. long, broadly ovate, entire, glabrous, base deeply cordate and with rounded auricles, petioles about as long as the leaves. *Peduncles* 1-5-flowered, varying in

length, pedicels, thickened upwards in fruit. *Sepals*  $\frac{1}{2}$  in. or more, elliptic lanceolate, tapering to a point which is shorter in the two inner ones, *Corolla* 2-3 in. long, rose-purple; tube 1-2 in. long, hairy within. *Stamens* included. *Capsule*  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam.; globose, apiculate. *Seeds*  $\frac{1}{2}$  in. long, glabrous, polished, black.

Moradabad (T. Thomson), Bundelkhand (Edgeworth), Guna (King) Flowers Sep. to Nov. *DISTRIB.* Himalaya from Kangra to Sikkim, up to 5,000 ft., Bengal, Deccan Hills and Upper Burma, extending to China and Japan. Often cultivated for the sake of the thickened pedicels which are eaten.

### 13. RIVEA, Choisy; Fl. Brit. Ind. iv, 183.

Climbing shrubs. *Leaves* cordate, more or less silky beneath long-petioled. *Peduncles* axillary, 1-3-flowered, or sometimes 7-flowered; bracts 2-3, narrow. *Sepals* ovate or lanceolate-oblong, subequal. *Corolla* large, white, salver-shaped; tube narrow, cylindric, limb with rounded plicate lobes. *Stamens* included; anthers narrow, oblong, straight. *Ovary* 4-celled, ovules 4, style filiform; stigmas 2, linear-oblong. *Fruit* subglobose, dry, indehiscent or opening irregularly, often 1-celled from the absorption of the septa. *Seeds* 1-4, glabrous, surrounded by mealy pulp.—Species about 10, three in India and the rest S. American.

*Sepals* ovate, obtuse, peduncles usually 1-flowered, leaves rarely broader than long . 1. *R. hyperateriformis*.  
*Sepals* lanceolate, acute, peduncles usually 7-flowered, leaves usually broader than long . 2. *R. ornata*.

*R. hypocrateriformis*, Chois. *Convol. Or.* 408; *F. B. I. iv*, 184, Watt *E. D.*; *Gamble Man. Ind. Timb.* 506; *Prain Beng. Pl.* 730; *Cooke Fl. Bomb. ii*, 254; *Brandis Ind. Trees.* 484. *Lettsonia Bona-nox*, Roxb. *Fl. Ind. i*, 494. *L. uniflora*, Roxb. *l. c.* 495. *Argyreia uniflora*, Sweet; *Brandis For. Fl.* 342.—*Vern. Phang* (Bundelkhand). The "Midnapore" or "Clove-scented creeper".

A large climbing shrub. *Stems* of old plants often very stout; bark grey, thin. Young shoots silky-pubescent. *Leaves*  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, rarely broader than long, orbicular, obtuse, emarginate, mucronate, usually broadly cordate at the base, glabrous or nearly so above, appressedly silky hairy beneath, basal nerves 5-7; petioles  $\frac{1}{2}$ -2 in. long, with an obscure gland on each side of the apex. *Flowers* pure-white, clove-scented; peduncles short, usually 1-flowered; pedicels very short, in the axils of linear deciduous bracts. *Sepals*  $\frac{1}{2}$  in. long, ovate elliptic, obtuse, silky-hairy. *Corolla*  $2\frac{1}{2}$ -3 in. long, tube very long, limb up to 2 in. across, glabrous or sparsely hairy outside. *Fruit*  $\frac{1}{2}$  in. in diam., globose, tipped with the persistent base of the style, brown, glabrous, polished. *Seeds* 1-4.

Often met with within the area, especially in the forest tracts of Merwara and Bundelkhand. Flowers during the rainy season. **DISTRIB.** Plains of Punjab, Rajputana and Sind to the Deccan, and from Assam and Bengal to S. India. The pure-white clove-scented flowers open at sunset and close and wither the next morning. The leaves and young shoots are eaten as a vegetable.

**2. R. ornata**, Chois. *Convol. Or.* 409; Royle *Ill.* 307 (not of F. B. I.); Gamble *Man. Ind. Timb.* 506; Prain *Beng. Pl.* 739. *R. ornata*, var. Griffithii. Clarke in *F. B. I.* iv, 183. *Lettsomia ornata*, Roxb. *Fl. Ind.* i, 496. *Argyrea ornata*, Sweet; Brandis *For. Fl.* 343.

A large spreading shrub. Stems subherbaceous, hardly ever twining. Leaves 3-6 in. long, usually broader than long, orbicular or reniform, obtuse, somewhat emarginate and often apiculate at the apex, rather silky beneath, lobes rounded; petioles shorter than the leaves, with a greenish gland on either side of the apex. Peduncles as long as the petioles, usually 7-flowered, bracts lanceolate. Flowers white, fragrant. Sepals about  $\frac{1}{2}$  in. long, ovate-lanceolate, acute, thick, silky-hairy outside, persistent. Corolla-tube 2-3 in. long, limb about 2-2 $\frac{1}{2}$  in. in diam. Berry oblong, pointed, 1-celled. Seeds usually solitary.

Dehra Dun and Siwalik Range. Flowers during the rainy season. **DISTRIB.** Eastwards to N. Bengal and the Sikkim Terai. The flowers open at sunset and wither on the following morning. The so called *R. ornata* of S. India is a separate species. A more correct name for this plant of N. India would be *R. Roxburghii*, Prain. (See Prain in Nov. Ind. viii, 89.)

#### 14. ARGYREIA, Lour.; Fl. Brit. Ind. iv, 184.

Climbing, rarely suberect shrubs. Leaves ovate-cordate to narrow-lanceolate, pubescent or silky beneath. Flowers showy, purple or rose, rarely white, usually in many-flowered cymes, often capitate, bracts usually conspicuous. Sepals herbaceous, leathery, slightly enlarged in fruit, often red within. Corolla funnel-shaped; limb plicate, more or less hairy outside, shortly lobed. Stamens included; anthers oblong, straight. Disk annular. Ovary 4-celled, 4-ovuled, style filiform; stigmas 2, globose. Fruit a dry hard berry. Seeds 4 or fewer, embedded in mealy pulp.—Species about 30, in Trop. Asia and Africa.

Of the 25 species described in the Fl. Brit. Ind. none are indigenous within the area of this flora. One, however, deserves mention, viz. *A. speciosa*, Sweet (*Lettsomia nervosa*, Roxb.), from its abundance in Dehra Dun as a naturalized escape. It is a large woody climber. Stems stout and densely clothed with white tomentum. Leaves 4-12

in. long, ovate, cordate, acute, glabrous above and persistently white-tomentose beneath. The deep rose-coloured flowers which open during the rainy season, are arranged in subcapitate cymes, peduncles 3-6 in. long; bracts large, foliaceous, ovate, acuminate, deciduous. pedicels and calyx white-tomentose. *Corolla* 2.2½ in. long, tubular-funnel-shaped, the bands silky-pubescent outside, limb 2 in. in diam. This plant is known as the "Elephant creeper" (Vern. *Samandar-sok*.) and is often cultivated for its handsome flowers and foliage. It is regarded as wild in Bengal.

### 15. LETTSOMIA, Roxb.; Fl. Brit. Ind. iv, 191.

Scandent more or less hairy shrubs. *Leaves* cordate or rounded at the base. *Flowers* in axillary peduncled densely corymbose or capitate cymes, bracts usually conspicuous. *Sepals* orbicular or elliptic, often thickened or somewhat enlarged in fruit. *Corolla* usually pink, funnel-shaped, limb plicate, lobes shallow. *Stamens* included or exserted; anthers oblong or linear, straight (not twisted). *Disk* annular or cupular. *Ovary* 2-celled, 4-ovuled, style filiform, stigmas 2, globose. *Fruit* dry, indehiscent. *Seeds* 4 or fewer, embedded in mealy pulp.—Species about 40, in S.-E. Asia and in Trop. Africa.—Hardly separable generically from *Argyreia*.

Flowers sessile in compact pedunculate heads,  
bracts spatulate-oblong . . . . . 1. *L. Thomsoni*.

Flowers pedicelled in dense corymbose cymes,  
bracts broadly ovate . . . . . 2. *L. setosa*.

1. *L. Thomsoni*, Clarke in F. B. I. iv, 193; Kanjilal For. Fl. 252; Brandis Ind. Trees 486. *Argyreia capitata*, Brandis For. Fl. 343 (not of Chois.)

A large climber. *Stems* sparsely villous. *Leaves* 3-5 in. long, ovate lanceolate, cordate, sparsely strigose on both sides, petioles 2-in. long. *Flowers* sessile, in compact peduncled heads, peduncles 2-5 in. long; bracts ½-1 in. long, spatulate-oblong, sparsely villous, deciduous or sometimes sub-persistent. *Sepals* longer than the bracts, ovate, acute, densely clothed with soft fulvous hairs, in fruit coriaceous and somewhat enlarged. *Corolla* nearly 2 in. long, rose-purple, hairy outside. *Capsule* usually 4-2-seeded.

Sub-Himalayan tracts from Dehra Dun and the Siwalik range to N. Oudh. Flowers May to October. DISTRIB. Outer Himalayan ranges from Kasauli to Sikkim ascending to 4,000 ft.

2. *I. setosa*, Roxb. Hort. Beng. 13 ; Fl. Ind. i, 490 ; F. B. I. iv, 194 ; Prain Beng. Pl. 742 ; Cooke Fl. Bomb. ii, 260 ; Brandis Ind. Trees 486 ; *Argyrea setosa*, Choisy. ; Brandis For. Fl. 344.

A large climber, branches strigose when young. Leaves 3-6 in. long, ovate-cordate, acute or acuminate, sparsely hirsute on both sides, becoming sometimes glabrous in age, petioles 1-3 in. long. Flowers in dense hairy corymbose cymes ; peduncles 2-8 in. long, stout, strigose ; bracts about  $\frac{1}{4}$  in. long, broadly ovate, obtuse, strigose, deciduous. Sepals  $\frac{1}{2}$  in. long, suborbicular, thick, fleshy and densely strigose, somewhat enlarged in fruit, the 2 inner with membranous margins. Corolla rose-coloured, about 1 in. long, upper portion as well as the bands densely setose outside. Stamens included, filaments dilated and hairy at the base. Berry  $\frac{3}{4}$  in. long, ovoid, subacute, red, succulent, usually 4-2-seeded.

Forests of Bundelkhand and N. Oudh. Flowers November to January. DISTRIB. Southwards from Mount Abu and Chota Nagpur to Central and S. India and Ceylon, extending to Upper and Lower Burma.

*Aniseia uniflora*, Choisy. ; Cooke Fl. Bomb. ii, 232. *A. martinicensis*, Choisy. ; Prain Beng. Pl. 727. *Ipomœa uniflora*, R. & S. ; F. B. I. iv, 201. A glabrescent twining herb with creeping stems. Leaves petioled, oblong, obtuse, entire. Peduncles axillary, 1-flowered. Outer sepals larger than the inner and decurrent on the pedicel. Corolla white, campanulate, hairy on the bands outside. Ovary 2-celled ; stigmas 2, capitate. Capsule 4-valved. Seeds 4, with a fringe of hairs round the margin.—Recorded by Edgeworth as growing in hedges in Bundelkhand. There are no Bundelkhand specimens in the Kew Herbarium, and there is much doubt as to the plant being indigenous within the area of this flora. DISTRIB. Nepal, Assam, E. Bengal, Chota Nagpur and S. Konkan to S. India and Ceylon ; also in the Malay Peninsula, extending to most tropical countries.

*Quamoclit phœnicia*, Choisy. ; Prain Beng. Pl. 737. *Q. coccinea*, Cooke in Fl. Bomb. ii, 261. *Ipomœa phœnicia*, Roxb. ; Fl. Ind. i, 502. *I. coccinea*. Clarke in F. B. I. iv, 199.—A subscandent herb with weak stems. Leaves petioled, ovate-cordate, acute, entire or lobed, glabrous. Flowers in axillary lax cymes, pedicels erect. Corolla salver-shaped, crimson orange or yellow. Stamens exserted. Capsule 4-celled.—Cultivated and quasi-wild within the area and throughout the warmer parts of India. Introduced from Trop. America, and now widely spread over S. E. Asia.

*Q. pinnata*, Boj. ; Prain Beng. Pl. 738. *Q. vulgaris*, Choisy. ; Cooke Fl. Bomb. ii, 261. *Ipomœa Quamoclit*, Linn. ; F. B. I. iv, 199.—This differs from the preceding in having the leaves pinnately divided into many filiform segments. The flowers are bright red or occasionally white.—Very common in gardens within the area and throughout India, also in a semi-wild condition. It is a native of Trop. America and is now widely spread in the warmer parts of the Old World.

## LXXVIII—SOLANACEÆ.

Herbs, shrubs or rarely small trees. *Leaves* alternate, often in unequal pairs, rarely clustered, never opposite, entire lobed or pinnatifid, stipules none. *Flowers* regular or rarely 2-lipped, usually hermaphrodite, very rarely dioecious, arranged in terminal or lateral axillary or extra-axillary cymes, or on solitary or clustered pedicels, bracts and bracteoles none. *Calyx* inferior, limb usually 5-lobed or -toothed, persistent and often much enlarged in fruit. *Corolla* funnel-shaped, campanulate or rotate, often plicate: lobes 5, rarely 10, or the limb subentire. *Stamens* on the corolla-tube, 5, or fewer in zygomorphic flowers: anthers dehiscing by apical pores or longitudinally. *Ovary* 2-celled, or imperfectly 1- or 4-celled, rarely 3-5-celled; style linear, stigma capitate or shortly lobed; ovules usually many, on prominently peltate placentas. *Fruit* a berry or a circumscissile or valved usually 2-celled capsule. *Seeds* many, compressed or subreniform, embryo (in the indigenous British Indian genera) curved—Species about 1,400, in tropical and subtropical regions of the world, but chiefly in Central and South America.

Fruit a berry:—

Corolla rotate or campanulate, lobes plicate in bud:—

Anthers connivent in a cone, dehiscing by apical pores; calyx small . . . . .

1. SOLANUM.

Anthers not connivent, dehiscing longitudinally; calyx much enlarged in fruit . . . . .

2. PHYSALIS.

Corolla urceolate, lobes valvate in bud, calyx accrescent . . . . .

3. WITHANIA.

Corolla funnel-shaped, lobes imbricate in bud, calyx not enlarging in fruit . . . . .

4. LYCIUM.

Fruit a capsule . . . . .

5. DATURA.

1. SOLANUM, Linn.; Fl. Brit. Ind. iv, 229.

Herbs or shrubs, sometimes subscandent, rarely small trees, unarmed or prickly. *Leaves* alternate, or subopposed in unequal pairs, entire lobed or pinnatifid. *Flowers* in dichotomous racemose lateral or terminal cymes. *Calyx* 5- or 10-lobed, rarely 4-lobed or subentire; accrescent or not in fruit. *Corolla* rotate, rarely campanulate, tube short; limb usually 5-lobed, plicate in bud. *Stamens* 5, rarely 4 or 6, attached to the corolla-throat, filaments short, anthers oblong, often narrowed upwards, connivent in a cone, opening by terminal pores or short slits. *Ovary* 2-celled, rarely (in cultivated

forms) 3-4-celled, style columnar, stigma small. *Fruit* a globose or elongated berry. *Seeds* many, discoid, embryo peripheric.—  
Species about 800, chiefly in S. America.

**Unarmed:—**

- A small usually glabrous herb with white flowers . . . . . 1. *S. nigrum*.  
A shrub or small tree densely clothed with grey or yellowish stellate tomentum . . . . . 2. *S. verbascifolium*.

**Armed:—**

- A very prickly diffuse bright-green herb with purple flowers . . . . . 3. *S. xanthocarpum*.

**Shrubs or undershrubs:—**

- Flowers bisexual, in racemose extra-axillary cymes . . . . . 4. *S. indicum*.  
Poduncles lateral, paired, one bearing a solitary fertile flower, the other a raceme of males . . . . . 5. *S. incanum*.

1. *S. nigrum*, Linn. *Sp. Pl.* 186; *Royle Ill.* 279; *F. B. I. iv*, 229; *Watt E.D.*; *Collett Fl. Siml.* 341; *Prain Beng. Pl.* 745; *Cooke Fl. Bomb. ii*, 263  
*S. rubrum*, Mill.; *Roxb. Fl. Ind. i*, 565.—Vern. *Makoi*. (Black Night shade.)

An erect nearly glabrous annual with much branched and somewhat angular stems. *Leaves* petioled, 1-3½ in. long, ovate or oblong, sinuate-toothed or lobed, petioles about ½ in. long. *Flowers* small, drooping-subumbellate on rather stout extra-axillary peduncles ¼-½ in. long; pedicels 5-8, slender, ½ in. long. *Calyx* ½ in. long, 5-toothed, glabrous or sparsely puberulous; teeth small, oblong, obtuse. *Corolla* white, rarely purple, ½ in. in diam., divided to below the middle into 5 oblong subacute lobes, glabrous outside. *Filaments* hairy at the base. *Ovary* globose, glabrous, style hairy towards the base. *Berry* ¼ in. in diam., supported by the saucer-shaped calyx, black, less often red or yellow, smooth and shining. *Seeds* yellow, minutely pitted.

A common weed, especially in cultivated ground. *Flowers* chiefly during the cold season in the plains. **DISTRIB.:** Throughout India and up to 9,000 ft. on the W. Himalaya; also in Afghanistan, Baluchistan and in all temperate and tropical regions of the world. The berries and juice are used medicinally, and the leaves and young shoots are eaten as spinach.

2. *S. verbascifolium*, Linn. *Sp. Pl.* 184; *Royle Ill.* 279; *F. B. I. iv*, 230; *Watt E. D.*; *Kanjilál For. Fl.* 253; *Gamble Man. Ind. Timb.* 508; *Collett Fl. Siml.* 342; *Prain Beng. Pl.* 746; *Cooke Fl. Bomb. ii*, 263; *Brandis Ind. Trees* 459. *S. pubescens*, *Roxb. Fl. Ind.* 564. *S. orianthum*, *Don Prod.* 98.—Vern. *Aseda* (Bijnor), *lan-tamáku* (Dehra Dun).

A tall erect unarmed shrub or small tree, densely tomentose with yellowish or grey scurfy stellate hairs. *Leaves* 4-8 in. long, elliptic-lanceolate, acute or acuminate, entire, softly pubescent above, densely woolly beneath, thickly herbaceous; base usually acute, sometimes



rhomboid or rounded, main lateral nerves about 8 pairs, petiole 1-2 in. Flowers many, densely clustered in woody 2-chootomous corymbose subterminal cymes; peduncles erect, stout, 1-4 in. long; pedicels  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, stout. Calyx  $\frac{1}{2}$  in. long, densely stellate-tomentose, enlarged in fruit but shorter than the berry; tooth triangular, acute. Corolla white,  $\frac{1}{2}$  in. across, stellate-hairy outside; lobes  $\frac{1}{2}$  in. long, acute. Ovary hairy, style glabrous. Berry  $\frac{1}{2}$  in. in diam., globose, yellow. Seeds minutely dotted.

Dehra Dun, Siwalik range and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Bundelkhand and in other parts of the area, frequently met with in hedges near villages. Flowers during the greater portion of the year.—DISTRIB.: Throughout India in the tropical and sub-tropical zones and up to 3,000 ft. on the Himalaya; also in Ceylon, extending to the Nicobar Islands, Malaya, N. Australia and N. America. The roots, leaves and fruit are used in native medicine, and in S. India the plant is said to be cultivated for its fruit which is eaten.

3. *S. xanthocarpum*, Schrad. & Wendl. *Sert. i*, S. t. 2; F. B. I. iv, 236; Watt E. D. *Collett Fl. Siml.* 343; *Prair. Beng. Pl.* 746; *Cook's Fl. Bomb.* ii, 265. *S. diffusum*, Roxb. *Fl. Ind.* i, 568. *S. Jacquinii*, Willd. *Roxb. Fl. Ind.* i, 569; *Royce Ill.* 279.—Vern. Kateli.

A very prickly bright-green perennial herb, young parts stellate tomentose. Stem flexuose, woody at the base; branches many, armed with compressed straight or somewhat curved yellow glabrous shining prickles up to  $\frac{1}{2}$  in. long. Leaves 2-4 in. long, ovate or elliptic, sinuate or subpinnatifid, rounded and unequal-sided at the base, clothed especially beneath with stellate hairs, ultimately glabrous, the midrib and often the main lateral nerves armed with long straight yellow spines, petioles up to 1 in. long. Flowers few, in extra-axillary shortly peduncled cymes or solitary; pedicels curved, stellately hairy. Calyx  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, densely stellate-hairy and prickly; lobes linear-lanceolate, acute. Corolla bluish-purple, 1 in. in diam.; lobes acute, hairy outside. Filaments glabrous. Ovary ovoid, glabrous as also the style. Berry  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., yellow or white streaked with green. Seeds glabrous.

Abundant within the area by roadsides and on waste ground. Flowers during the greater part of the year. DISTRIB.: Throughout India, ascending to 7,000 ft. on the Himalaya; also in Ceylon, extending to Malaya, Trop. Australia and Polynesia. All parts of the plant are used as ingredients of native medicines, and the fruits are said to be sometimes eaten.

4. *S. indicum*, Linn. *Sp. Pl.* 187; *Roxb. Fl. Ind.* i, 570; *Royce Ill.* 279; F. B. I. iv, 234; Watt E. D.; *Kanjilal For. Fl.* 273; *Gamble Fl. Bomb.* ii, 206; *Brandis Ind. Trees* 459.—Vern. Bhut-kataia.

An erect very prickly undershrub, 1-6 ft. high; prickles large, compressed at the base, usually somewhat curved. Stem stout, often tinged with purple, the branches minutely stellate-hairy. Leaves 2-6 in. long,

ovate, acute, subentire or sinuate-lobed, cuneate or truncate at the base and often unequal-sided, sparsely prickly and stellate-pubescent on both sides, the upper surface with also a few bulbous-based hairs. *Flowers* in extra-axillary racemose cymes; peduncles and pedicels short, clothed with grey stellate pubescence and sometimes prickly. *Calyx* 5-toothed, about  $\frac{1}{4}$  in. long, sometimes with a few straight slender spines, teeth triangular. *Corolla* blue, rotate,  $\frac{3}{4}$ -1 in. in diam.; with purple stellate hairs outside; lobes  $\frac{1}{2}$  in. long, broadly triangular. *Berry*  $\frac{1}{2}$  in. in diam., globose, orange-yellow when ripe, usually glabrous, supported by the scarcely altered calyx. *Seeds*  $\frac{1}{8}$  in. in diam., minutely dotted.

Common within the area on waste ground. **DISTRIB.** Throughout India, ascending to 5,000 ft. on the Himalaya; also in Ceylon and extending to Malaya, China and the Philippines. The roots and berries are used in native medicine, and the latter as a vegetable in some parts of India. Allied to the above is *S. torvum*, Swartz, a common plant in Bengal. It is less prickly and has white flowers and larger berries, and may very possibly occur within this area.

5. *S. incanum*, Linn. *Sp. Pl.* 188; *Cooke Fl. Bomb.* ii, 267; *S. coagulans*, Forsk. *Fl. Egypt.-Arab.* 46; *F. B. I.* iv, 236; *Watt E. D. Vern. Asind* (Merwara).

A stiff prickly shrub, densely clothed with soft yellowish stellate pubescence; prickles stout, recurved, shining above, broad and usually tomentose at the base. *Leaves* petioled, 3-4 $\frac{1}{2}$  in. long, ovate-elliptic sinuate or lobed, stellate-tomentose above with soft fulvous hairs, densely woolly beneath, midrib and sometimes the lateral nerves with scattered prickles, base subcordate or truncate, rarely cuneate, petioles prickly. *Peduncles* lateral, usually in pairs, one bearing a solitary fertile flower, the other a raceme of males. *Calyx* densely stellate-hairy,  $\frac{1}{2}$  in long, usually prickly in the fertile flowers; lobes triangular, acute. *Corolla* blue, under  $\frac{3}{4}$  in. long, stellate-hairy on both sides. *Filaments* glabrous. *Ovary* globose, hairy at the summit, style hairy below. *Berry* about 1 in. in diam.; ovoid or subglobose, yellow. *Seeds* minutely pitted.

Siwalik range (Royle), Merwara (Duthie). *Flowers* Jan.-May. **DISTRIB.**: Punjab Plain and eastwards to the *bhābar* and lower hills of Kumaon ascending to 4,000 ft.; also in S. India extending to Baluchistan, Arabia Egypt and to Tropical and S. Africa. The fruit is said to be eaten by natives either raw or pickled. This plant is more rigid and more tomentose than *S. Melongena*, and the tomentum is usually tinged with yellow; the calyx-tube is often strongly spinous, and the deeply divided corolla is more densely hairy outside.

**SOLANUM MELONGENA, L.** The Egg-plant or Brinjal (*Vern. Baigan* or *baingan*) is largely cultivated within the area and in all warm countries. It is not truly wild in India, and its native country is not quite certain. DeCandolle regarded it as a native of Asia, and not of America, whilst others believed it to have come from Arabia. Many distinct forms or

racæ are recognized according to the shape or colour of the fruit. The plant is more or less prickly according to the nature of the soil. In rich garden soil the prickles almost or entirely disappear. When cultivated as a field crop it becomes rather prickly, and very much so as an escape, under which conditions the peduncles bear 3-4 small and usually roundish fruits. Prain mentions two varieties: 1. *ESCULENTA* (*S. longum*, Roxb.), a stout prickly herb with the fruit always cylindrical, and, according to Roxburgh, a distinct species; and 2. *INSANA* (*S. insanum*, Roxb.) which is a very prickly herb found in a semi-wild state near villages. Its fruit is quite round, and the fruiting peduncles usually bear more than one. The fruit of the egg-plant is always eaten cooked. Its value as a vegetable is increased by its coming into season during the autumn months when other kinds are scarce. The leaves possess narcotic properties, and the seeds are regarded as stimulant. See also Roxb. *Fl. Ind. i.* 556; *D. C. L'Orig. Pl. Cult.* 229. *Field and Gard. ; Crops N. W. Prov. and Oudh, part iii,* 31, t. 95; *F. B. I. iv,* 235; *Watt E. D.; Comm. Prod. Ind. ; Prain Beng. Pl.* 746; *Cooke Fl. Bomb. ii,* 269.

**SOLANUM TUBEROSUM**, Linn. The Potato. Vern. *Alu*. A native of temperate regions in S. America. Introduced into Europe during the sixteenth century it reached India in the early portion of the seventeenth century. Largely cultivated within the area of this flora and on the neighbouring parts of the Himalaya. Acclimatized varieties are sown in the plains from about the middle of September, and the hill kinds and those imported from Europe later on. For further information, see *DC. L'Orig. Pl. Cult.* 36; *F. & G. Crops N. W. Prov. and Oudh, part iii,* 15; *Watt E. D.; Comm. Prod. India*.

## 2. **PHYSALIS**, Linn. ; *Fl. Brit. Ind. iv,* 238.

Annual or perennial herbs. *Leaves* alternate, entire, sinuate or shortly lobed. *Flowers* solitary, axillary, pedicelled. *Calyx* campanulate, 5-fid., much enlarged in fruit and loosely enclosing the berry; teeth small, connivent. *Corolla* campanulate, lurid-yellow, often with purple spots near the base. *Stamens* 5, attached near the base of corolla; anthers oblong, shorter than the filaments, dehiscing longitudinally. *Ovary* 2-celled, style linear, stigma obscurely 2-lobed. *Fruit* a globose berry. *Seeds* many or few, compressed, smooth or faintly tuberculate, embryo peripheric.—Species about 30, mostly tropical American.

**P. minima**, Linn. *Sp. Pl.* 183; *Roxb. Fl. Ind. i,* 563; *F. B. I. iv,* 238; *Watt E. D.; Collett Fl. Siml.* 343; *Prain Beng. Pl.* 750; *Cook Fl. Bomb. ii,* 270.—Vern. *Ban-tigariya*.

Annual. *Stem* erect, 6-18 in. high, striate, more or less pubescent and often viscid. *Leaves* petioled, thin, 1-2½ in. long, ovate, acute, sinuate-toothed or almost lobed, more or less pubescent, base cuneate, petioles about 1 in. long. *Flowers* solitary, on long slender deflexed pedicels.

*Calyx* (in flower)  $\frac{1}{2}$ – $\frac{1}{3}$  in., not angular, base truncate; lobes triangular, acute, nearly equalling the tube, ciliate. *Corolla*  $\frac{1}{2}$  in. long, clear yellow, or with 5 basal spots inside, limb with very short lobes. *Berry*  $\frac{1}{2}$ – $\frac{1}{3}$  in. in diam., completely enclosed within the enlarged membranous 5-10-ribbed reticulately-veined calyx. *Seeds* discoid or reniform, muriculate, orange-yellow.

Common within the drier portions of the area, usually on waste ground. Flowers May–Aug. **DISTRIB.:** Common on the plains of Punjab and Bengal, and in Peninsular India, also in Ceylon, and up to 7,000 ft. on the outer Himalaya, extending to Afghanistan, Baluchistan and to Tropical Africa and Australia.

**VAR.** *indica*, *F. B. I.* iv, 238; *Watt E. D.*; *Prain Beng. Pl.* 750. *P. indica*, *Lamk. Encycl.* ii, 102. The leaves and fruiting calyx are glabrescent, and the latter is distinctly 5-angular. The corolla has no basal spots. Common within the area and throughout India in similar situations.

*P. peruviana*, *Linn.*; *Roxb. Fl. Ind.* i, 562; *F. B. I.* iv, 238; *Watt E. D.*; *Prain Beng. Pl.* 750; *Cooke Fl. Bomb.* ii, 270.—*Vern. Tipari.* A small shrub, resembling *P. minima*, but much stouter and with larger flowers and fruit. It is a native of Trop. America, whence it was introduced into India and S. Africa, and hence its name of “Cape Gooseberry” by which it is usually known. The plant is much cultivated in India, and the bright amber-coloured fruit is eaten either raw or cooked.

### 3. WITHANIA, Pauq.; *Fl. Brit. Ind.* iv, 239.

Unarmed shrubs. *Leaves* entire. *Flowers* axillary, sessile or shortly pedicelled, fascicled or solitary, sometimes polygamo-dioecious. *Calyx* campanulate, 5- or 6-toothed, enlarged and sub-globose in fruit. *Corolla* campanulate; lobes 3-6, short, valvate in bud. *Stamens* attached near the base of the corolla; anthers oblong, debiscing longitudinally. *Ovary* 2-celled, style linear, stigma shortly 2-fid. *Fruit* a globose berry. *Seeds* very many, discoid, embryo peripheric.—Species 4 or 5, from S. Europe to N. Africa and the Canary Islands, also in W. Asia.

*W. somnifera*, *Dunal in DC. Prod.* xiii, pt. 1, 453; *F.B.I.* iv, 239; *Watt E.D.*; *Gamble Man. Ind. Timb.* 503; *Prain Beng. Pl.* 759; *Cooke Fl. Bomb.* ii, 271; *Brandis Ind. Trees* 490. *Physalis somnifera* *Link*; *Royle III.* 279 *Physalis flexuosa*, *Linn.*; *Roxb. Fl. Ind.* i, 561.—*Vern. Askand, asind.*

An erect branching undershrub up to 5 ft. high, nearly all parts more or less stellately tomentose; branches flexuose, terete, densely tomentose. *Leaves* petioled, 2-4 in. long, ovate, subacute, base acute; main lateral nerves about 6 pairs, prominent, petioles  $\frac{1}{2}$ – $\frac{1}{3}$  in. long. *Flowers* greenish or lurid-yellow, usually about 5 together in subsessile umbelliform

cymes, pedicels  $\frac{1}{2}$  in. long or less. *Calyx* (in flower)  $\frac{1}{2}$  in long, stellate-tomentose; teeth linear from a broad base, acute. *Corolla*  $\frac{1}{2}$  in. long; lobes lanceolate, acute, hairy outside. *Berry*  $\frac{1}{4}$  in. in diam., enclosed in the much enlarged inflated somewhat 5-angled pubescent calyx, red when ripe.

Abundant within the area in dry situations. **DISTRIB.** Throughout the drier portions of India and in Ceylon, extending to Persia, Arabia, the Mediterranean region, the Canaries and to Trop and S. Africa. The roots and other parts of this plant are used medicinally, and the fruit possesses the same property as that of the allied *W. coagulans* of coagulating milk. The latter species, known as *punirband* (Cheesemaker), is found in the drier parts of the Punjab and of Sind, also in Afghanistan and Baluchistan, and is very generally employed as a substitute for rennet.

#### 4. LYCIUM, Linn.; Fl. Brit. Ind. iv, 240.

Spinous shrubs, usually glabrous. *Leaves* small, alternate or often fascicled at the nodes, entire, linear-terete or flat. *Pedicels* usually solitary, rarely fascicled at the nodes, flowers small. *Calyx* campanulate, at first 5-merous, then 3-5 lobed or 2-lipped, not or slightly enlarged in fruit. *Corolla* funnel-shaped; lobes 5 or 4, imbricate in bud. *Stamens* 5 or 4, on the corolla-tube; anthers oblong, exserted or included, dehiscing longitudinally. *Ovary* 2-celled, style filiform, stigma subcapitate. *Fruit* a small globose or oblong berry. *Seeds* several few or solitary, compressed, embryo peripheric.—Species about 50, in temperate and sub-tropical regions, especially in S. Africa and S. America.

*L. europæum*, Linn. *Sp. Pl.* 102; *Royle Ill.* 279; *Brandis For. Fl.* 345; *Ind. Trees* 490; *F. B. I.* iv, 240; *Watt E.D.*; *Gamble Man. Ind. Timb.* 503.—Vern. *Achmehndi* (Ajmere), *Chirchitta* (Delhi).

A glabrous thorny shrub, sometimes pubescent when young. *Leaves*  $\frac{1}{2}$ –1 in. long, linear-oblong or obovate. *Flowers* white or pale-purple,  $\frac{1}{2}$  in. long, solitary, on slender pedicels which are shorter than the flowers. *Calyx*  $\frac{1}{2}$  in. long, teeth rarely less than five. *Corolla*  $\frac{1}{2}$  in. long, tube cylindrical, gradually widening upwards and somewhat curved; lobes less than half the length of the tube, rounded. *Filaments* glabrous at the base, anthers almost included. *Berry*  $\frac{1}{2}$  in. in diam., sub-globose, yellow or red. *Seeds* many.

Found in Merwara and Rajputana. Flowers Oct. to March. **DISTRIB.:** Abundant in the Punjab plain, Sind and Gujara't; also in Afghanistan, Baluchistan and Persia, extending through W. Asia to the N. African and Mediterranean coasts and to the Canaries. In Europe and W. Asia the flowers are usually purplish. The berries are eaten by natives, and camels and goats feed on the branches. The wood affords fuel and is used also in the construction of wattled frames for the walls of huts.

5. *DATURA*, Linn.; Fl. Brit. Ind. iv, 242.

Coarse rank shrub-like herbs, glabrous or minutely pubescent. *Leaves* large, entire sinuate or deeply toothed. *Flowers* large, solitary, pedicelled, purple or white. *Calyx* long, tubular, herbaceous, 5-toothed, circumscissile above the base in fruit. *Corolla* long, funnel-shaped, mouth wide; limb plicate, entire or shortly 5- or 10-lobed. *Stamens* attached near the base of the corolla-tube, filaments filiform; anthers included, linear, longitudinally dehiscent. *Ovary* 2 or spuriously 4-celled, style filiform, stigma 2-lobed. *Fruit* an ellipsoid 4-celled usually spinous capsule, 4-valved or irregularly bursting near the apex. *Seeds* very many, compressed, rugose, embryo peripheric.—Species about 15, widely distributed in the temperate and tropical regions of the world.—For historical and economic information regarding the different species see Bentley and Trimen *Med. Pl. and Watt's Commercial Products of India*.

Capsule deeply 4-valved, erect; corolla 5-toothed.

(*Stramonium*):—

- |                                  |                           |
|----------------------------------|---------------------------|
| Flowers white . . . . .          | 1. <i>D. Stramonium</i> . |
| Flowers purple or blue . . . . . | 2. <i>D. Tabula</i> .     |

Capsule opening irregularly near the apex, reflexed or spreading (*Dutra*):—

- |   |                         |
|---|-------------------------|
| Whole plant densely clothed with greyish-green tomentum, corolla white, 10-toothed; capsule globose, reflexed, covered with long slender spines . . . . .             | 3. <i>D. Metel</i> .    |
| Plant glabrous or minutely pubescent, corolla 5-toothed, usually purplish outside; capsule reflexed, covered with blunt tubercles . . . . .                           | 4. <i>D. fastuosa</i> . |
| Plant glabrous or nearly so, calyx and corolla puberulous outside, corolla 5-toothed, white or cream-coloured; capsule spreading, covered with sharp spines . . . . . | 5. <i>alba</i> .        |

1. *D. Stramonium*, Linn. *Sp. Pl.* 179; *F. B. I.* iv, 242; *Watt, E. D.*; *Comm. Prod. Ind.* 438; *Collett Fl. Siml.* 344.—Thorn-Apple.

A coarse annual. 2-4 ft. high, glabrous or farinose-puberulous. Leaves stalked, about 7 in. long, ovate, deeply toothed or sinuate, pale-green. *Calyx* 1-1½ in.; lobes ½ in long, ovate-lanceolate. *Corolla* 3-6 in. long, white, 1-3 in. in diam.; lobes 5, cuspidate. *Capsule* erect, ovoid, deeply 4-valved, covered with rigid long and short prickles surrounded below by the enlarged reflexed base of the calyx.

Occasionally met with as an alien in the Sub-Himalayan districts also in Merwāra. **DISTRIB.** Himalaya from Kashmir to Sikkim up to 8,000 ft.; also in the hilly districts of Central and S. India, and generally throughout the temperate and warmer regions of the world. It occurs in Britain as a casual weed. DeCandolle regarded the plant as having come originally from the countries bordering the Caspian, and to have entered India, by way of Persia and Afghanistan. The Himalayan form has been referred to *D. Wallichii*, Dunn., which is a taller plant more caespitose and with larger flowers.

2. *D. Tatula*, Linn. *Sp. Pl.* 256; *Nees in Trans. Linn. Soc.* xvii, 76. *D. Stramonium* var. *Tatula*, D.C.; *F. B. I.* iv, 242; *Watt, E. D.*; *Comm. Prod. Ind.*; *Prair. Beng. Pl.* 759; *Collett Fl. Siml.* 344.

Similar in many respects to *D. Stramonium*, but the stems are more branching and usually tinged with purple; the leaves are more sharply toothed and they are often cordate at the base; the flowers are larger and bluish or purple in colour, and the longer prickles of the capsule are more of one size.

The distribution of this species in India is like that of the preceding. It is found at Simla and in other parts of the Himalaya, also near villages in the Sub-Himalayan tracts and in the hilly districts farther south. Believed by DeCandolle and others to be a native of Central America. In Britain it is known as a casual weed, and it has been introduced into Australia.

3. *D. Metel*, Linn. *Sp. Pl.* 173; *F. B. I.* iv, 243; *Watt, E. D.*; *Comm. Prod. Ind.*; *Cooke Fl. Bomb.* ii, 273.

Whole plant densely clothed with greyish tomentum. Stem erect, 3-4 ft. high, stout, herbaceous, terete. Leaves 6-8 in. long, ovate-lanceolate or broadly ovate, acute or acuminate, unequal at the base and often cordate, entire or repand-dentate, densely tomentose on both surfaces and generally glandular, petioles  $2\frac{1}{2}$ -3½ in. long; peduncles at first erect, afterwards nodding. Calyx about 3 in. long, inflated towards the middle, persistent and reflexed in fruit; teeth lanceolate, acuminate, unequal. Corolla about twice as long as the calyx, white tinged with green below, pubescent outside, limb 10-toothed. Capsule globose, nodding, covered with long rather slender spines.

I have seen no record of this plant having been found within the limits of this flora, though probably occurring near habitations in the Sub-Himalayan tracts. It is found not infrequently in Kashmir and in other parts of the North-West Himalaya. It is not uncommon in S. Europe, but it is supposed to have originally spread from S. America to all other parts of the world. It is regarded in India as being the most poisonous of all the species of *Datura*, and for this reason it is much resorted to for criminal purposes. The plant is at once recognized by the characters given above.

4. *D. fastuosa*, Linn. Syst. ed. x, 932; Roxb. Fl. Ind. i, 561; F.B.I. iv, 242; Watt E. D.; Comm. Prod. Ind.; Collett Fl. Siml. 344; Prain Beng. Pl. 751; Cooke Fl. Bomb. ii, 273.—Vern. Kāla dhutra. Kāla dhatura.

Glabrous or slightly puberulous. Stem erect, 4-5 ft. high, woody below; branches zigzag, purplish and with scattered white spots. Leaves up to 8 in. long, ovate-lanceolate, acuminate, sinuate or repand-dentate, base unequally cuneate. Flowers erect, often double when cultivated. Calyx about 2 in. long; teeth 5, triangular-lanceolate, acuminate; base persistent and reflexed in fruit. Corolla violet or purplish outside, white within, limb 5-plicate and 5-angled, folds long-cuspidate. Capsule nodding, dehiscing irregularly, covered with stout tubercles.

Throughout India, in gardens and on waste ground, often appearing as if wild. This is the species most commonly met with in the hotter parts of this country. It is found also in Africa and throughout the tropics of both hemispheres.

5. *D. alba*, Nees in Trans. Linn. Soc. xvii 73; Wight Ic. 852; Dun. in D.C. Prod. xiii, pt. 1, 542. *D. Metel*, Roxb. Fl. Ind. i, 561 (non Linn.). *D. fastuosa*, var. *alba*, Clarke in F. B. I. iv, 243; Watt E.D.; Comm. Prod. India; Prain Beng. Pl. 751; Cooke Fl. Bomb. ii, 273.—Hummatu. Rheed. Hort. Mal. ii; 47, t. 28; Rumph. Herb. Amb. v, 242, t. 67, fig. 1.—Vern. Dhatura.

Stem 5-6 ft. high, herbaceous or slightly woody below. Leaves stalked, 6-7 in. long, ovate, acuminate, repand-dentate, unequal at the base, glabrous, bright green. Flowers white or cream-coloured, erect, shortly stalked. Calyx about 1½ in. long, deeply 5-toothed; teeth triangular-lanceolate, acuminate. Corolla 4½-5 in. long, 5-plicate, puberulous outside, limb obscurely 5-lobed, lobes cuspidate. Capsule globose, spreading or nodding, aculeate.

Dr. T. Thomson's Moradabad specimen at Kew, obtained from a garden is the only one I have seen which represents the species as occurring within the limits of this flora, although doubtless it exists in other localities. DISTRIB.: Common in Bengal and throughout India in gardens, as well as in waste ground near villages, flowering and producing fruit all through the year. It is found in Hongkong, and according to Benthams is probably of Asiatic origin. The seeds are described as intensely narcotic, and as being used both medicinally and for criminal purposes.

*Datura suaveolens*, H. & B. (*Brugmansia suaveolens*, G. Don) A handsome shrubby plant with large white fragrant flowers. It is often grown in the gardens of both natives and Europeans, and is usually known as the "trumpet flower." It is a native of Mexico.

LYCOPERSICON ESCULENTUM, Mill. is the Tomato or Love-apple. Vern. Vilayati baigan. It is extensively cultivated in gardens throughout India, both on the hills and in the plains, and is occasionally found as an escape. It came originally from Peru. See Roxb. Fl. Ind. i, 565 (Solanum); DC. L'Orig. Pl. Cult. 231; F. B. I. iv, 237; Watt E. D.; Prain Beng. Pl. 743; Cooke Fl. Bomb. ii, 275.



**CAPSICUM, Linn.** This genus contains the various forms of Chillies and Red and Yellow Peppers so widely cultivated in India and other tropical countries. It is indigenous in S. America and is believed to have been introduced into India about the middle of the seventeenth century. The very large number of cultivated forms, many of which were previously recognized as distinct species, have by recent authors been reduced to the two original Linnean species: *C. annum* and *C. frutescens*, the one an annual and the other a perennial. Moreover, there is some probability that these two may have originated from a single very variable S. American species; for, as Prain remarks, the forms of *C. annum* are often not truly annual in the tropics, and in temperate regions the perennial tropical forms rarely persist for more than one season. (See Prain in Journ. As. Soc. Beng. Vol. lxxiv, part 2, extra number (1905), 335; Beng. Pl. 747; Cooke Fl. Bomb. ii, 276; DC. L'Orig. Pl. Cult. 229; F. B. I. iv, 238; Watt E D.; Comm. Prod. India 264.

The following key, taken from Prain's "Bengal Plants," shows the distinguishing characters of the varieties or forms of the two now recognized species as met with in N. India:—

- Pedicels solitary, erect or reflexed; fruit erect, spreading or pendent usually longer than the pedicel. Annual or perennial plants:—
  - Flowers white; berries red, orange or yellow when ripe:—
    - Fruit not globular:—
      - Berries tapering, much longer than broad:—
        - Fruit stout; flesh thick, usually mildly pungent; calyx not enclosing base of berry . . . . . *C. annum*.
        - Fruit slender; flesh thin, keenly pungent; calyx enclosing base of berry . . . . . *C. annum* var. *acuminata*.
      - Berries not or hardly longer than broad, usually blunt; calyx not enclosing base of berry:—
        - Berries circular in section, flesh thin, pungent . . . . . *C. annum* var. *abbreviata*.
        - Berries swollen, angular in section, flesh very thick, hardly at all pungent . . . . . *C. annum* var. *grossa*.
    - Fruit globular, extremely pungent . . . . . *C. annum* var. *cerasiforme*.
  - Flowers purple; berries dark-purple, becoming orange-red, longer than broad, slightly pungent; calyx hardly enclosing the base . . . . . *C. annum* var. *nigra*.
- Pedicels 2 or more, erect; fruit always erect, red, shorter than the pedicel, pungent. Perennial plants with white flowers:—



Corolla elongate, tube cylindric with a more or less expanded throat, limb with sub-equal lobes or 2-lipped, stamen 4 or 2:—

Stamens 4, inserted within the corolla-tube :—

Corolla not distinctly 2-lipped; lobes rounded, sub-equal :—

Anther-cells confluent towards the apex, divaricate downwards, capsule septicidal . . . 5. SUTERA.

Anther-cells parallel, contiguous but distinct, capsule septicidal and loculicidal . . . 6. MONIERA.

Corolla distinctly 2-lipped :—

Corolla with a 2-gibbous throat :—

Calyx 5-angled and 5-toothed; anther-cells confluent, often 1-celled . . . 7. MIMULUS.

Calyx widely campanulate, 5-lobed, anther-cells contiguous but distinct . . . 8. MAZUS.

Corolla-throat not gibbous, anther-cells distinct :—

Placentas either separating in fruit or, if conjoined in a column, the column not winged, seeds terete . . . 9. STEMODIA.

Placentas always united in a column which is winged by the remains of the septa, seeds angular . . . 10. LIMNOPHILA.

Stamens 2, perfect, the lower pair reduced to staminodes, all inserted within corolla-tube, capsule loculicidal . . . 11. DOPATRUM.

Stamens if 4 the lower pair, if 2 the staminodes inserted in corolla-throat, the upper or only perfect pair inserted in the corolla-tube, capsule septicidal :—

Corolla elongate, tube cylindric with a more or less expanded throat, limb with sub-equal lobes or 2-lipped, stamen 4 or 2:—

Stamens 4, inserted within the corolla-tube :—

Corolla not distinctly 2-lipped; lobes rounded, sub-equal :—

Anther-cells confluent towards the apex, divaricate downwards, capsule septicidal . . . 5. SUTERA.

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Placentas either separating in fruit or, if conjoined in a column, the column not winged, seeds terete . . . 9. STEMODIA.

Placentas always united in a column which is winged by the remains of the septa, seeds angular . . . 10. LIMNOPHILA.

Stamens 2, perfect, the lower pair reduced to staminodes, all inserted within corolla-tube, capsule loculicidal . . . 11. DOPATRIUM.

Stamens if 4 the lower pair, if 2 the staminodes inserted in corolla-throat, the upper or only perfect pair inserted in the corolla-tube, capsule septicidal :—

Stamens 4 with perfect anthers:—

Calyx winged or keeled, mouth  
oblique . . . . . 12. TORENIA.

Calyx not winged or keeled,  
segments equal . . . . . 13. VANDELLIA.

The 2 upper stamens only with  
perfect anthers, the two lower  
reduced to staminodes and  
inserted on corolla-throat:—

Leaves with parallel veins,  
staminodes bilobed, capsule  
ovate or shortly oblong . . . . . 14. ILYSANTHES.

Leaves pinnate-veined, stami-  
nodes entire, capsule linear-  
oblong . . . . . 15. BONNAYA.

Corolla small, tube very short, uniform,  
stamens 2, anther-cells diverging at  
the base, the tips confluent, capsule  
loculicidal.—A minute glabrous  
creeping herb . . . . . 16. GLOSSOSTIGMA.

Corolla with the upper lip or the 2 upper  
lobes innermost in bud or, if corolla-  
lobes imbricate as in *Scoparia*, lobes 4  
and stamens 4:—

Corolla-tube very short, subrotate, throat  
narrow:—

Corolla-lobes 4, sub-equal, imbricate,  
stamens 4, capsule septicidal . . . . . 17. SCOPARIA.

Corolla-lobes 4 or 5, unequal, one or  
both the lateral outermost in bud,  
stamens 2, capsule loculicidal. . . . . 18. VERONICA.

Corolla-tube elongate (except in *Sopu-  
bia*); lobes 5, the two upper inner-  
most in bud; stamens 4, didy-  
namous, capsule loculicidal.—Plants  
often parasitic or partially so:—

Calyx tubular, 5-toothed or -fid:—

Corolla-tube straight or nearly so,  
lobes subequal . . . . . 19. BUCHNERA.

Corolla-tube abruptly incurved at  
or about the middle, the 2 upper  
lobes smaller . . . . . 20. STRIGA.

Calyx spathaceous, compressed, split in front; corolla somewhat ventricose at the throat, limb obscurely 2-lipped, anthers with one perfect and one sessile empty cell . . . 21. CENTRANTHERA.

Calyx campanulate, 5-lobed or fid.

Corolla tubefunnel-shaped; tube short, throat dilated; anthers 2-celled, one of the cells sterile, leaves pinnatisect . . . 22. SOPUBIA.

Corolla-tube cylindric, anther-cells both fertile, leaves toothed . . . 23. LINDENBERGIA.

### 1. VERBASCUM, Linn.; Fl. Brit. Ind. iv, 250.

Erect, tomentose or woolly, usually tall herbs. *Leaves* all alternate. *Flowers* yellow, often tinged with purple or red, rarely white, arranged in simple or paniced terminal racemes or spikes, ebracteate. *Calyx* 5-lobed or partite, lobes imbricate. *Corolla* rotate; lobes 5, broad, the 2 posterior ones (upper lip) outside in bud. *Stamens* 5; filaments all, or only the 3 upper ones, bearded; anthers transverse or oblique, cells confluent. Style dilated towards the apex, stigma simple. *Fruit* a globose oblong or ovoid capsule, septicidally 2-valved, the valves separating from the axis. *Seeds* many, not winged, rugose, embryo straight.—Species about 150, occurring in Europe, N. Africa and in Western and Central Asia.

**V. Thapsus**, Linn. *Sp. Pl.* 177; Roxb. *Fl. Ind.* i, 560; F. B. I. iv, 250; Watt *E. D.*; Collett *Fl. Siml.* 347. Vern. *Gidar-tamaku* (Jackal's tobacco), known also by the name "Mullein" in England.

An erect herb, densely clothed with soft grayish-yellow stellate tomentum. *Stems* usually stout, simple, winged with the prolonged leaf-bases. *Leaves* entire or crenate; radical and lower cauline stalked, 6-18 in. long, obovate-lanceolate; upper oblong, acute or acuminate. *Flowers* crowded in a simple terminal woolly spike, 6-10 in. long, yellow, bracts often longer than the flowers. *Calyx* 5-lobed. *Corolla*  $\frac{3}{4}$ -1 in. across, concave, woolly outside. *Stamens* with 3 of the filaments clothed with white hairs, the other 2 longer and glabrous. *Capsule* ovoid, tomentose.

This species has been collected in Dehra Dun, N. Oudh and in the districts of Moradabad and Agra, also in Bundelkhand. *Flowers* in April. **DISTRIB.:** Punjab Plain and throughout the Himalayan ranges from Bhutan to Kashmir, ascending to 13,000 ft. in N. Kumaon. It is found

also in Afghanistan and extends to Britain. The plant has narcotid properties, and the seeds are sometimes used for stupefying fish.

## 2. CELSIA, Linn.; Fl. Brit. Ind. iv, 251.

Annual or biennial herbs. *Leaves* alternate, crenate sinuate-dentate or incised. *Flowers* in terminal simple or rarely branched spikes or racemes. *Calyx* deeply 5-fid., lobes imbricate. *Corolla* rotate, tube very short; lobes 5, broad, somewhat unequal, the upper outside in bud. *Stamens* 4, didynamous or nearly equal, filaments all woolly; anthers transverse or oblique, with confluent tips. *Ovary* 2-celled, ovules many, style entire, stigma compressed, terminal. *Fruit* a globose or ovoid septicidally 2-valved capsule, valves usually 2-fid. *Seeds* many, minute, transversely rugose, not winged.—Species about 40, extending from W. Asia to Abyssinia, N. Africa and S. Europe.

*C. coromandeliana*, Vahl *Symb. Bot.* iii, 79; Roxb. *Fl. Ind.* iii, 100; F.B.I. iv, 251; Watt *E. D.*; Collett *Fl. Siml.* 347; Prain *Beng. Pl.* 757; Cooke *Fl. Romb.* ii, 281.

An erect pubescent annual herb. *Stem* 2-3 ft. high, glandular above. *Radical leaves* petioled, crowded, 2-4 in. long, lyrate-pinnatifid; the large terminal lobe usually oblong, obtuse, toothed; cauline sessile, smaller, and passing upwards into bracts, oblong-ovate, cordate, toothed, hairy on both sides. *Flowers* in simple or branched terminal racemes which are 1-2 ft. long, pedicels  $\frac{1}{2}$ - $\frac{3}{4}$  in. long; bracts shorter, ovate. *Calyx* shorter than the pedicels, deeply divided; segments linear-oblong, subacute, entire or serrulate. *Corolla*  $\frac{1}{2}$  inch across, yellow. *Filaments* all densely bearded with purple hairs. *Capsule*  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., sub-globose, glabrous. *Seeds* oblong, truncate, verrucose.

Frequent within the area and often as a weed in cultivated ground, flowering in the plains during the cold season. *DISTRIB.*: Throughout India from the Punjab to Ceylon, ascending to 5,000 ft. on the Himalaya, extending to Afghanistan, Burma and China. The juice of this plant is used for dysentery and also as a sedative.

## 3. LINARIA, Juss.; Fl. Brit. Ind. iv, 251.

Herbs. *Leaves* usually opposite, or whorled below and alternate above. *Flowers* axillary, solitary or passing into terminal racemes or spikes with the floral leaves reduced to bracts. *Calyx* 5-partite, segments imbricate. *Corolla* 2-lipped and personate, tube spurred

in front at the base; upper lip erect, 2-lobed; lower spreading, 3-lobed, throat usually closed by the tumid palate. *Stamens* didynamous, ascending, included; anther-cells distinct, parallel. *Style* filiform, stigma minute. *Fruit* an ovoid or globose 2-celled, capsule, each cell or the anterior only opening by an apical pore. *Seeds* angled, rugose wingless or discoid and winged.—Species about 150, chiefly in temperate regions of the world.

**L. ramosissima**, Wall. *Pl. As. Rar.* ii, 43, t. 153; *Royle Ill.* 290; *F. B. I. iv*, 251; *Watt E. D.*; *Collett Fl. Siml.* 347; *Prain Beng. Pl.* 757; *Cooke Fl. Bomb. ii*, 282. Toad-flax.

A glabrous or slightly pubescent perennial herb, often much branched from the rootstock; branches slender, 1-2 ft. long, usually prostrate and glabrous. *Leaves* alternate, petioled, very variable in size and breadth, glabrous or the lowermost somewhat pubescent; lower 5-7 lobed, triangular-bastate; upper usually lanceolate, with acute diverging basal lobes; petioles filiform,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long. *Flowers* on slender axillary usually solitary ebracteate pedicels longer than the petioles. *Calyx*  $\frac{1}{2}$  in. long, hairy but often glabrous when in fruit; segments linear-lanceolate, the margins membranous towards the base. *Corolla* (including spur) nearly  $\frac{1}{2}$  in. long, yellow, hairy outside; spur straight obtuse, shorter than the tube; lobes of both lips oblong, obtuse. *Filaments* somewhat pubescent. *Style* stout. *Seeds* small echinulate.

On walls and rocks within the drier portions of the area, common in the Jumna and Chambal ravines in the districts of Agra and Etawah also in Bundelkhand. Flowers during the cold season. **DISTRIB.**: Throughout India in the plains and up to 5,000 ft. in Kumaon, extending to Afghanistan and Upper Burma.

#### 4. ANTIRRHINUM, Linn.; *Fl. Brit. Ind.* iv, 253.

Annual or perennial herbs. *Leaves* entire or lobed, lower opposite, upper alternate. *Flowers* solitary and axillary or passing into terminal racemes with bract-like floral leaves. *Calyx* 5-partite; segments imbricate. *Corolla* 2-lipped and personate; tube compressed, saccate in front at the base; upper lip erect, 2-lobed; lower spreading, 3-lobed; palate broad, bearded, closing the throat. *Stamens* didynamous; anther-cells distinct, parallel. *Style* filiform, stigma 2-lobed. *Fruit* an ovoid or globose capsule, each cell opening by one pore, or the posterior by a pair of toothed pores. *Seeds* many, minute, oblong, rugose or pitted.—Species about 35, in temperate regions of the northern hemisphere, chiefly in N. America.

**A. Orontium**, Linn. *Sp. Pl.* 617; *Royle Ill.* 290: *F.B.I. iv*, 253; *Collett Fl. Siml.* 348. Corn Snapdragon.



An erect herb, 6-18 in. high. *Stem* much branched from the base, more or less glandular-hairy above. *Leaves* 1-2 in. long, sub-sessile, linear or oblong-lanceolate, entire. *Flowers*  $\frac{1}{2}$  in. long, pale-pink streaked with purple. *Sepals* narrow, spreading, longer than the corolla. *Capsule*  $\frac{1}{2}$  in. long, pubescent. *Seeds* compressed, concave on one face, back keeled, margins thickened.

Common within the area, in cornfields. Flowers during the cold season. **DISTRIB.:** Punjab Plain, Salt Range and W. Himalaya up to 6,000 ft., mostly in cultivated ground, extending to N. Africa, Europe and the Canaries.

### 5. SUTERA, Roth; Fl. Brit. Ind. iv, 258.

Annual or perennial herbs, or small shrubs, glabrous pubescent or sometimes viscid. *Leaves* opposite or the upper often alternate, pinnatifid toothed or subentire. *Flowers* axillary or in terminal usually simple racemes; bracts small, leafy, not adnate to the pedicels. *Calyx* usually 5-partite; lobes narrow, more or less imbricate in bud. *Corolla* tubular, not spurred; tube slender, cylindric or funnel-shaped, straight or somewhat curved, throat dilated or not; lobes 5, subequal, obtuse, imbricate in bud, the 2 upper outside in bud and rather smaller than the 3 lower. *Stamens* 4, didynamous, included; anthers 1-celled by confluence. *Ovary* 2-celled; style filiform. *Fruit* an ovoid-oblong septicidal capsule, valves bifid. *Seeds* many, rugose.—Species about 120, chiefly in S. Africa.

*S. glandulosa*, Roth. Nov. Sp. 291; F. B.I. iv, 258; Prain Beng. Pl. 759; Cooke Fl. Bomb. ii, 285.

A diffuse or sub-erect glandular-pubescent annual, branched from or near the base, branches 6-12 in. long. *Leaves* shortly petioled,  $\frac{1}{4}$ - $\frac{3}{4}$  in. long, ovate in outline pinnatifid, the segments more or less deeply toothed. *Flowers* nearly sessile, solitary in the axils, or the uppermost in racemes. *Calyx*  $\frac{10}{16}$ - $\frac{1}{2}$  in. long; segments linear-oblong, subacute. *Corolla* white, about twice as long as the calyx, glabrous; lobes subequal, oblong-obtuse. *Capsules*  $\frac{1}{2}$  in. long, viscid-pubescent or glabrous. *Seeds* minute, yellowish.

Common in the tracts of the Jumna ravines, and in the black soil of Bundelkhand. Flowers in Jan. and Feb. **DISTRIB.:** From Behar and Rajputana to the Deccan and S. India, extending to Arabia, Nubia and Egypt.

### 6. MONIERA, B. Juss.

UNDER HERPESTIS IN FL. BRIT. IND. IV, 272.

Glabrous herbs. *Leaves* often punctate, entire or toothed, or multifid when submerged. *Flowers* axillary or in racemes, yellow blue or white, bracteoles small or none. *Calyx* 5-partite; segments

sub-equal, imbricate, upper largest; lateral innermost, usually narrow. *Corolla* slightly 2-lipped, tube cylindric; lips spreading, the upper outside in bud and emarginate or 2-lobed, lower 3-lobed. *Stamens* didynamous, included; anther-cells contiguous, distinct, parallel. *Ovary* 2-celled, style dilated at the top, stigma entire or 2-lobed. *Fruit* a globose or ovoid 2-grooved capsule, valves 2 or 4, separating septicidally and loculicidally from the placentiferous dissepiment. *Seeds* many, minute.—Species about 50, in tropical and sub-tropical regions, chiefly in America.

Leaves obovate-oblong or spatulate, flowers stalked; capsule ovoid, acute . . . . .

1. *M. cuneifolia*.

Leaves linear-lanceolate, flowers sessile; capsule globose . . . . .

2. *M. Hamiltoniana*.

**M. cuneifolia**, *Michx. Fl. Bor. Amer. ii.*, 22; (Monniera); *Cooke Fl. Bomb. ii.*, 286. *Herpestis Monniera*, *H. B. & K.*; *Royle Ill.* 291; *Collett Fl. Siml.* 352; *Prair. Beng. Pl.* 765; *H. Monniera*, *Benth.*; *F. B. I. iv.*, 272; *Watt. E. D. Gratiola Monniera*, *Linn.*; *Roxb. Fl. Ind. i.*, 141.

A creeping somewhat succulent herb. *Stems* several, 4-12 in. long, rooting at the nodes, terete, branches ascending. *Leaves* sessile, decussate,  $\frac{1}{2}$ -1 in. long, obovate-oblong or spatulate, entire, nerves obscure, lower surface dotted. *Flowers* axillary and solitary; pedicels slender,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; bracteoles linear, shorter than the pedicels. *Calyx* divided to the base, glabrous; upper segment ovate-acute, longer and broader than the others. *Corolla*  $\frac{1}{2}$  in. long, blue or white with purple veins; lobes nearly equal and rounded, glistening with shining dots when fresh. *Anthers* bluish-purple, pollen white. *Capsules*  $\frac{1}{2}$ -in. long, ovoid, acute, glabrous.

Abundant within the area in wet places. **DISTRIB.**: Throughout India, ascending to 4,000 ft. on the Himalaya, and in all warm countries. The juice of this plant mixed with petroleum is used by Hindus externally for rheumatism.

**M. Hamiltoniana**, *T. Cooke Fl. Bomb. ii.* 286. *Herpestis Hamiltoniana*, *Benth.*; *F. B. I. iv.*, 272; *Collett. Fl. Siml.* 353; *Prair. Beng. Pl.* 765.

An erect glabrous herb up to 10 in. high. *Stem* stout, simple or branched, often decumbent at the base. *Leaves* subsessile,  $\frac{1}{2}$ -1 in. long, linear-lanceolate, acute, tapering to the base, entire or sub-serrate, nerves indistinct. *Flowers* sessile, opposite and solitary, bracteoles linear-subulate. *Calyx*  $\frac{1}{2}$  in. long, upper lobe broadly ovate, acute, the 2 lateral narrowly lanceolate. *Corolla* pink with a bluish tinge; tube about as long as the calyx, narrowed upwards, upper lip deeply emarginate. *Anthers* white. *Capsules*  $\frac{1}{2}$  in. diam., globose, glabrous.

Moradabad (T. Thomson), sub-Himalayan tracts, in marshy ground. **DISTRIB.**: Punjab ascending to 3,000 ft. and extending south to the Konkan and eastwards to Assam and Sylhet; also in Trop. Africa.

7. *MIMULUS*, Linn.; Fl. Brit. Ind. iv, 258.

Erect prostrate or creeping herbs, often viscid. *Leaves* opposite. Flowers solitary, axillary. *Calyx* tubular, 5-angled; lobes 5, short. *Corolla* 2-lipped; upper lip 2-lobed, erect or reflexed; lower 3-lobed, spreading, throat usually with a swollen 2-lobed palate. *Stamens* 4, didynamous; anthers attached near the base of the corolla-tube, with divergent sub-confluent cells. *Ovary* 2-celled, style slender, stigma 2-lamellate. *Fruit* an oblong obovoid or sub-linear loculicidally 2-valved capsule. *Seeds* many, minute, oblong.—Species about 90, chiefly in extra tropical and mountainous regions of W. America, Asia, Australia and Africa.

*M. gracilis*, R. Br. Prod. 439; F. B. I. iv, 259; Collett Fl. Siml. 350; Prain Beng. Pl. 759; Cooke Fl. Bomb. ii, 287.

An erect ascending or decumbent glabrous perennial herb, 6-20 in. high, often branching from the base; stem and branches 4-angular, striate. *Leaves* 1½-3 in. long, rather fleshy, turning black when dry, sessile or the lowermost shortly stalked, ½-amplexicaul, narrowly oblong or oblong-lanceolate, obtuse, entire or slightly toothed, glabrous. *Flowers* on slender pedicels, ½-1½ in. long. *Calyx* (in flower) ¼ in. long, somewhat enlarged in fruit; teeth short, deltoid, acute. *Corolla* about ¼ in. long, white or pale-blue spotted with yellow, glabrous; lobes shallow, rounded. *Stamens* included, filaments glabrous, anthers subreniform. *Ovary* glabrous. *Capsules* ¼ in. long, included in the slightly enlarged calyx. *Seeds* smooth.

Wet places near Saharanpur, also in Dehra Dun and in the sub-Himalayan tracts of N. Ondh. Flowers during April and May. *DISTRIB.*: Punjab Plain, and N. Bengal; Himalaya from Kumaon to Kashmir up to 5,000 ft; extending to China, Australia and to Trop. and S. Africa.

8. *MAZUS*, Lour; Fl. Brit. Ind. iv, 259.

Small herbs, often with runners. *Leaves* opposite, sometimes resolute, those of the flowering branches mostly alternate. *Flowers* in terminal sub-second racemes; bracts minute, bracteoles none. *Calyx* broadly campanulate; lobes 5, leafy. *Corolla* 2-lipped, tube short, upper lip erect, 2-fid.; lower much larger, spreading, 3-fid., throat with a 2-lobed palate. *Stamens* didynamous, anther-cells contiguous but distinct. *Ovary* 2-celled, short, stigma 2-lamellate. *Fruit* a small globose or compressed loculicidal capsule included within the calyx, valves entire. *Seeds* many, minute, ovoid. Species about 6, extending from China to India and Australia.

*M. rugosus*, Lour. *Fl. Cochinch.* 385 ; Royle *Ill.* 291 ; F. B. I. iv, 259 ; Collett *Fl. Siml.* 351 ; Prain *Beng. Pl.* 759. *Columna tomentosa*, Roxb. *Fl. Ind.* iii, 98.

A small glabrous or sparsely hairy annual. Stems tufted, without runners. Radical leaves crowded, 1-3 in. long, oblong or obovate-spathulate, coarsely crenate, narrowed to the base into a short petiole. Scapes many from the root, 2-10 in. long, leafless or with a few spathulate leaves. Racemes terminal, 1-6 in. long, bracteoles none. Flowers pale-blue or white streaked with blue. Calyx  $\frac{1}{4}$  in. long; lobes half as long as the tube, ovate-lanceolate, acute, spreading in fruit. Corolla  $\frac{1}{2}$  in. long. Capsule  $\frac{1}{2}$  in., globose. Seeds very minute, pale-yellow.

Chiefly in the northern districts of the area, in the sub-Himalayan tracts from Dehra Dun eastwards, Moradabad (T. Thomson), Agra (Munro). DISTRIB. Punjab Plain, Himalaya from Kashmir to Bhutan up to 7,000 ft., Bengal, Burma and the Malay Peninsula; also in Afghanistan, extending to China, Japan, Java and the Philippines.

### 9. STEMODIA, Linn. ; Fl. Brit. Ind. iv, 265.

Herbs, sometimes woody below, glandular-pubescent and often aromatic. Leaves opposite or sometimes whorled. Flowers solitary, axillary, passing into terminal leafy spikes or dense racemes; bracts leaf-like, bracteoles 1 or 2. Calyx 5-partite; segments narrow, imbricate, equal or the upper somewhat larger. Corolla 2-lipped, tube cylindric; upper lip suberect, entire or notched, outside in bud; lower spreading, 3-lobed, throat not plicate. Stamens 4, didynamous, included; anther-cells distinct, stipitate, all fertile. Ovary 2-celled; style filiform, dilated but not winged at the apex, stigma usually 2-lobed. Fruit a globose ovoid or acuminate capsule; valves 2, bifid and dehiscing septicidally, or 4-valved and dehiscing both septicidally and loculicidally. Seeds many, minute.—Species about 30, in tropical regions of both hemispheres.

*S. viscosa*, Roxb. *Cor. Pl.* ii, 33, t. 163 ; Fl. Ind. iii, 94 ; F.B.I. iv, 265 ; Watt *E. D.* ; Prain *Beng. Pl.* 761 ; Cooke *Fl. Bomb.* ii, 288.

An erect viscidly pubescent aromatic herb, 3-24 in. high; stem and branches angular. Leaves  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, sessile, usually oblong, tapering to the base, or the upper cordate-amplexicaul, acute or rarely obovate at the apex, glandular-pubescent or subglabrous, margins serrulate or subentire. Flowers axillary, solitary or in terminal, few-flowered racemes; pedicels filiform,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, bracteoles 1, close under the calyx, linear-subulate. Calyx  $\frac{1}{3}$  in. long; segments narrowly lanceolate, acute, glandular-hairy and ciliate. Corolla twice as long as the calyx,

violet, glabrous, tube compressed, lower lip hairy in the throat, lobes about equal in length, *Filaments* glabrous; anther-cells shortly stalked sub-orbicular. *Ovary* glabrous. *Capsules*  $\frac{1}{2}$  in. long, ovoid-oblong, acuminate, 4-valved and glabrous.

Common within the area, especially in rice-fields and in swampy ground. Flowers during the cold season. *DISTRIB.* W. Behar, C. and S. India; also in Afghanistan.

# 10. LIMNOPHILA, R. Br.; Fl. Brit. Ind., iv, 265.

Glabrous or pubescent aromatic herbs, often aquatic or paludine. *Leaves* with transparent dots, opposite or whorled, toothed or incised, often multifid when submerged. *Flowers* sessile or pedicelled, axillary, solitary or passing into terminal spikes or racemes; bracts leaf-like, bracteoles small or none. *Calyx* 5-partite, segments sub-equal or the posterior larger. *Corolla* 2-lipped, tube cylindric; upper lip outside in bud, suberect, entire or 2-fid.; lower spreading, 3-lobed, throat not plicate. *Stamens* didynamous, included; anther-cells usually separate, stipitate. *Ovary* 2-celled; style slender, deflexed at the tip, stigma 2-lamellate. *Fruit* an ovoid or oblong capsule, opening both septicidally and loculicidally, the placentiferous dissepiment separating with the valves. *Seeds* many, small, angular, reticulate.—Species about 30, in the warmer parts of Africa, Asia and Australia.

Flowers sessile or nearly so . . . . . 1. *L. sessiliflora*.

Flowers stalked, the pedicels usually longer than the calyx:—

Stems 1-2 ft., corolla  $\frac{1}{2}$  in. long or more . . . . . 2. *L. racemosa*.

Stems 3-8 in., corolla  $\frac{1}{2}$  in. long. . . . . 3. *L. gratioloides*.

1. *L. sessiliflora*, Blume Bijdr. 749; F.B.I. iv, 270; Prain Beng. Pl. 764; Cooke Fl. Bomb. ii, 290.

A small pubescent or subglabrous herb. *Stem* rather stout, 4-8 in. long. *Leaves* sessile or nearly so, usually 3-6 in. a whorl; the upper often undivided, lanceolate, acute, serrate or dentate, 3-nerved, the lower divided into numerous very narrow segments. *Flowers* solitary, axillary. *Calyx* less than  $\frac{1}{2}$  in. long, glandular hairy, divided about  $\frac{1}{2}$  way down; tube hemispheric in fruit, membranous not striate; lobes ovate, long-acuminate. *Corolla*  $\frac{3}{4}$  in. long, pink. *Capsule*  $\frac{1}{2}$  in. long, sub-globose, glabrous. *Seeds* truncate at both ends.

In rice-fields and swampy ground. Flowers in rainy and cold seasons. *DISTRIB.*: From Punjab Plain and Bengal to C. India and the Deccan; also in Ceylon, Malay Peninsula and Burma, extending to China, Japan,

Java and Trop. Africa. This species closely resemble short-flowered forms of *L. gratioloides*, also states of *L. heterophylla* in which the multifid submerged leaves are not present.

2. *L. racemosa*, Benth. *Scroph. Ind.* 442; *F. B. I.* iv, 271; *Prain Beng. Pl.* 764; *Cooke. Fl. Bomb. ii*, 291. *Cyrilla aquatica* Roxb.; *ii*, 115.

An aquatic herb with creeping roots; stems stout, erect, attaining 12 ft. or more in deep water, glabrous or slightly hairy. *Upper leaves* sessile, 1½-2 in. long, opposite or 3-nately whorled, ovate or oblong-lanceolate, serrulate, glabrous, ½-amplexicaul and somewhat rounded at the base, 3-5-nerved; lower leaves capillaceo-multifid, often deflexed and root-like. *Flowers* rather large, usually in erect terminal leafy racemes, 2-4 in. long, bracteoles linear-subulate; pedicels filiform, longer than the bracteoles. *Calyx* ½ in. long, lobes as long as the tube, deltoid, acute or acuminate, often coloured, membranous and not striate in fruit. *Corolla* ½ in. long or more, pale-violet with yellow tube; lobes of upper lip rounded, of the lower acute. *Capsules* ½ in. long, sub-globose, enclosed in the membranous calyx. *Seeds* truncate at both ends.

Merwara (Duthie), C. India (Edgeworth) on black soil. *DISTRIB.*: Rajputana, N. & C. Bengal, Decan, Ceylon extending to Java. Small states of this species are with difficulty distinguished from *L. gratioloides*.

3. *L. gratioloides*, R. Br. *Prod.* 442; *Royle Ill.* 291; *F.B.I.* iv. 271; *Prain Beng. Pl.* 264; *Cooke Fl. Bomb. ii*, 291. *Columnnea balsamica*, Roxb. *Fl. Ind.* iii, 97.

A small herb, 3-8 in high, with a strong scent of turpentine, roots creeping; stems much branched from the base, erect, stout or slender, sub-4-angular, rooting from the lower nodes, glabrous, striate. *Leaves* sessile, usually all whorled, pinnatifid or the lowest multifid, the upper occasionally opposite and entire, ¼-¾ in. long, linear-oblong, serrate-dentate, 1-nerved. *Flowers* pedicelled, usually axillary and solitary, rarely racemose, bracteoles linear-subulate; pedicels longer than the leaves, filiform, spreading. *Calyx* (in flower) ¼-½ in long, membranous, glandular, hemispheric and not striate in fruit; lobes narrowly triangular, acute or acuminate. *Corolla* ½ in. long, pink. *Capsules* ½ in. long, sub-globose. *Seeds* truncate or obscurely rounded at each end.

Saharanpur dist. (Royle), Moradabad (T. Thomson), Merwara (Duthie) Rohilkhand and Bundelkhand (Edgeworth), in swamps and rice-fields. *Flowers* during the rainy and cold seasons. *DISTRIB.*: Punjab Plain Rajputana and throughout the greater part of India, also in Ceylon, extending to Baluchistan, Trop. Africa, the Malay Archipelago, China, Japan and Australia.

*VAR. intermedia* F.B.I. lc.—*Stem* robust. *Leaves* all close-set. *Flowers* sometimes racemose with opposite entire bract-like leaves. Moradabad (T. Thomson). Patli Dun (Strach. & W. No. 2). Sub-Siwalik tract (Edgeworth). *DISTRIB.*: Punjab Himalaya 3-4,000 ft., extending to Baluchistan.

**VAR. elongata.** Benth.—*Stem* very long; upper leaves opposite, entire; submerged leaves capillaceous-multifid. — Moradabad (F. Thomson), Oudh (Wallich), extending to the Central Provinces and the Deccan.

**11. DOPATRIUM, Buch.-Ham. ; Fl. Brit. Ind. iv, 273.**

Glabrous slender annual marsh herbs. *Leaves* few, opposite; lower pairs small, the upper minute, remote. *Flowers* small, solitary, axillary, usually violet; pedicels filiform or none, bracteoles none. *Calyx* small, 5-partite; lobes narrow, imbricate. *Corolla* 2-lipped; tube slender below, dilated into a broad throat; upper lip outside in bud, 2-fid.; lower broad, 3-lobed, scarcely ling. *Stamens* 2, upper only perfect, included; anther-cells parallel, distinct, equal; staminodes 2, minute, included within the tube. *Ovary* 2-celled, style short, stigma 2-lamellate. *Fruit* a small globose or oblong capsule, opening loculicidally, the valves placentiferous. *Seeds* many, very small, tuberculate.—Species 12, in Asia, Africa and Australia.

**D. juncoum, Buch. — Ham. iv Benth. Scroph. Ind. 31; F.B.I. iv, 274; Prain Beng. Pl. 763; Cooke Fl. Bomb. ii, 292. Gratiola juncoua, Roeb.; Fl. Ind. i, 142.**

Rather fleshy; stems erect, 6-12 in. high, branched from the base, lower portion swollen and spry. *Leaves* few, sessile; the lower oblong or obovate, obtuse or subacute, entire upper much smaller, in pairs and remote. *Flowers* subracemose, in opposite distant pairs, sessile or shortly stalked; pedicels (when present) filiform, erect in fruit. *Calyx-lobes* oblong, obtuse. *Corolla*  $\frac{1}{2}$  in. long, pinkish-violet. *Capitula*  $\frac{1}{16}$  in. in diam, globose. *Seeds* minute, tuberculate.

In rice-fields and swampy ground, flowering in rainy season. **DISTRIB.** Throughout India and in Ceylon; Himalaya, in Brit. Garhwal and Kumaon at low elevations; extending to the Malay Islands, China, Japan and Philippines to Australia.

**12. TORENIA, Jinn. ; Fl. Brit. Ind. iv, 275.**

Glabrous or pubescent herbs. *Leaves* opposite, entire, crenate or serrate. *Flowers* often showy, axillary or in terminal or pseudo-axillary umbels or racemes, bracteoles none. *Calyx* tubular, 3-5-winged or -folded or -keeled, 2-lipped or 3-5-toothed. *Corolla* 2-lipped, tube cylindric, somewhat curved and dilated upwards; upper lip concave or pinched, notched or 2-fid.; lower larger, spreading, 3-lobed. *Stamens* didynamous, all perfect, 2 upper included, 2 lower adnate to the throat, appendaged or not at the base and connivent under the upper lip; cells often confluent. *Ovary* 2-celled, style slender, stigma

2-lamellate. *Fruit* a linear or oblong septicoid capsule, included, valves separating from the placentiferous dissepiment. *Seeds* many, rugose or cancellate.—Species 25, in tropical Asia and Africa, and one in America.

*T. cordifolia*, Roxb. *Cor. Pl.* ii, 32, t. 161; *Fl. Ind.* iii. 95; *Royle Ill.* 291; *F.B.I.* iv, 276; *Collett Fl. Siml.* 353; *Prain Beng. Fl.* 767; *Cooke Fl. Bomb.* ii, 292.

An erect nearly glabrous annual, 4-10 in. high. *Stems* and branches 4-angled or almost 4-winged. *Leaves*  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long, ovate, acute or sub-obtuse, sharply serrate, glabrous, base usually cuneate, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* solitary or fasciated in the axils towards the ends of the branches; pedicels slender, often exceeding the leaves. *Calyx*  $\frac{3}{4}$  in. long, 2-lipped, ovoid, cordate or rounded at the base, wings not decurrent on the pedicel, teeth ciliate. *Corolla*  $\frac{3}{4}$  in. long, bluish-purple. *Filaments* arching, not toothed. *Capsules* oblong, acute, enclosed in the persistent calyx. *Seeds* minute, truncate at both ends.

Dehra Dun. Flowers Sep. **DISTRIB.:** W. Himalaya from Simla to Kumaon up to 6,000 ft., Behar and hilly parts of Peninsular India, Burma, Java and China.

### 13. VANDELLIA, Linn.: *Fl. Brit. Ind.* iv, 279.

Herbs, usually annual, glabrous or pubescent. *Leaves* opposite, often toothed, penninerved (except in *V. pyxidaria*). *Flowers* small, axillary or sub-racemose, bracteoles none. *Calyx* subcampanulate; lobes free or connate, not winged. *Corolla* 2-lipped, tube cylindric; upper lip outside, erect, concave, notched or bifid, lower broader, 3-lobed, spreading. *Stamens* didynamous, usually, all perfect, 2 posterior usually included; 2 anterior with arched filaments, appendaged near the base; anthers touching or cohering in pairs under the upper lip, cells divaricate. *Ovary* 2-celled, style slender, stigma 2-lamellate. *Fruit* a globose or ovoid or long-cylindric septicoidally 2-valved capsule, valves separating from the placentiferous septum. *Seeds* many, rugose.—Species about 26, chiefly in Trop. Asia.

Leaves pinnately veined:—

Capsule equalling the calyx or shorter:—

Calyx in flower not divided beyond the middle

Calyx divided to the base or nearly so

Capsule much longer than the calyx:—

Calyx in flower cleft to the middle

Calyx-lobes free to the base or nearly so

1. *V. crustacea*.

2. *V. multiflora*.

3. *V. nummularifolia*.

4. *V. pedunculata*.



Leaves with 3-5 parallel nerves; calyx divided to the base, shorter than the ovoid orbicular capsule . . . 5. *V. pyxidaria*.

1. *V. crustacea*, Benth. *Scroph. Ind.* 35; *F.B.I. iv*, 279; *Collett Fl. Siml.* 354; *Prain Beng. Pl.* 768; *Cooke Fl. Bomb. ii*, 295. *Torenia varians*, Roxb. *Fl. Ind. iii*, 96. *Gratiola lucida*, Vahl.; *Roxb. Fl. Ind. i*, 138.

A glabrous or sparsely hairy annual, 4-18 in. high, diffusely branched from the base; stems angular. *Leaves* shortly petioled,  $\frac{3}{4}$ - $\frac{1}{2}$  in. long, ovate or lanceolate, sub-acute, margins with shallow teeth or sub-entire. *Flowers* axillary and sub-racemose at the ends of the branches; pedicels  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, slender, stiff. *Calyx*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long in flower, elongating in fruit, 5-ribbed, not divided beyond the middle; teeth triangular, acute. *Corolla*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, purplish or white. *Capsule* shorter than the calyx, oblong-ovate, obtuse.

A common weed within the area. **DISTRIB.:** Throughout India and in Ceylon, Himalaya up to 4,000 ft., and generally scattered throughout the tropics of the Old World.

2. *V. multiflora*, G. Don *Syst. iv*, 549; *F.B.I. iv*, 280; *Prain Beng. Pl.* 768. *Torenia multiflora*, Roxb. *Fl. Ind. iii*, 96.

A small erect glabrous herb, somewhat succulent. *Stem* 4-6 in. high, with 3-chotomous quadrangular branches. *Leaves* 1-2 in. long; lowest stalked, upper sessile, oblong ovate-oblong or obovate, obtuse, entire sinuate or subserrate. *Flowers* minute, racemed, pedicels exceeding the calyx. *Calyx*  $\frac{1}{16}$  in. long, divided to the base or nearly so; segments narrowly acuminate, lanceolate, *Capsule* about as long as the calyx, suborbicular, with an acute apex.

Guna in C. India (King). **DISTRIB.:** Behar, E. Bengal and S. India; Sarju Valley in Kumaon up to 4,000 ft. and eastwards to Assam.

3. *V. nummularifolia*, Don *Prod.* 86; *F.B.I. iv*, 282; *Collett Fl. Siml.* 354; *Lindernia nummulariæfolia*, Wettst. in *Engl. and Prantl, Pf.* iv, 3 B, 79.

An erect glabrous herb, simple or branching from the base, branches 2-6 in. long, divaricate, not rooting. *Leaves* sessile or shortly stalked,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, broadly ovate obovate or suborbicular, crenate-serrate, nerves subflatellate. *Pedicels* very slender, or in subumbellate or few-flowered racemes longer than the leaves. *Calyx*  $\frac{1}{8}$  in. long, divided half-way or to the base when in fruit, teeth acute. *Corolla*  $\frac{1}{2}$  in. long, reddish-purple, lateral lobes of lower lip white. *Capsule*  $\frac{1}{2}$  in. long, ellipsoid, acute, longer than the calyx.

Dehra Dun (Duthie). **DISTRIB.:** Himalaya from Kashmir to Sikkim up to 7,000 ft., and on the Khasia Hills; also in Trop. Africa.

4. *V. pedunculata*, Benth. *Scroph. Ind.* 37; *F.B.I. iv*, 282; *Prain. Beng. Pl.* 769; *Cooke Fl. Bomb. ii*, 295. *Torenia diffusa*, Roxb. *Fl. Ind. iii*, 95.

A small diffuse glabrous herb. *Stems* often creeping at the base and rooting from the nodes, sometimes tinged with purple; branches 4-10 in. long, slender. *Leaves* shortly stalked,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovate, obtuse or subacute, obscurely crenate-serrate, usually unequally subcordate at the base. *Flowers* solitary, axillary, pedicels about twice as long as the leaves. *Calyx-segments* almost free to the base, narrowly lanceolate, acuminate. *Corolla*  $\frac{3}{4}$  in. long, white, margined with pale-purple and marked with a yellow spot on the lower lip. *Capsule* linear-lanceolate, acute, twice as long as the calyx. *Seeds* ellipsoid.

Abundant within the area in swamps and rice-fields, flowering during the rainy and cold seasons. **DISTRIB.:** Throughout India and in Ceylon, W. Himalaya up to 4,000 ft. and extending to the Malay Peninsula, Borneo, China and Cochin-China.

5. *V. pyxidaria*, Maxim. *Diagn. Pl. Nov. Dec. xix*, 413; *Prair Beng. Pl.* 769. *V. erecta*, Benth.: *F.B.I. iv*, 231. *Gratiola integrifolia*, Roxb. *Fl. Ind. i*, 137.

A small erect glabrous annual, 4-8 in. high, branching from the base, branches not rooting. *Leaves* sessile,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, elliptic or oblong, obtuse, entire or obscurely crenate; nerves 3-5 in. long, parallel. *Pedicels* axillary, solitary, slender, usually twice as long as the leaves. *Calyx-segments*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, free to the base, lanceolate or linear, rather obtuse, shorter than the ovoid-orbicular capsule.

Dehra Dun (Gamble), Rohilkhand (T. Thomson), Bundelkhand (Duthie). *Flowers* during the rainy and cold seasons. **DISTRIB.:** Himalaya from Kashmir to Assam, common in Bengal, also in C. and S. India, but not recorded from Ceylon; extending to Siam, China, Japan, Malaya and Polynesia and westwards to France. This plant closely resembles *Ilysanthes parviflora*, and the nerves of the leaves are parallel as in the latter genus. Roxburgh describes the plant as erect when young, but afterwards straggling.

#### 14. ILYSANTHES, Rafin.; *Fl. Brit. Ind. iv*, 283.

Annual glabrous slender marsh-plants. *Leaves* opposite, entire or toothed, 1-5-nerved from the base. *Flowers* small axillary or passing into terminal racemes, pedicels often reflexed in fruit, bracteoles none. *Calyx* 5-partite, segments narrow. *Corolla* 2-lipped, tube cylindric; upper lip outside, concave, notched; lower larger, spreading, 3-lobed. *Stamens*, the 2 upper only perfect, subincluded, the lower pair reduced to staminodes, anthers connivent, cells divaricate; staminodes 2, bilobed, one lobe glandular, the other glabrous. *Ovary* 2-celled, stigma 2-lamellate. *Fruit* a septicidal capsule; valves entire, separating from the placentiferous septum. *Seeds*, many, rugose.—Species 35, India, extending to Siam, S. Africa and S. America.

**I. parviflora**, Benth. in DC. Prod. x, 419; F.B.I. iv, 283; Cooke Fl. Bomb. ii, 296; Prain Beng. Pl. 769. *Gratiola parviflora*, Roxb.; Fl. Ind. i, 140.

A small erect glabrous herb. Stem about 6 in. high, simple or diffusely branched, 4-sided. Leaves sessile or the lowermost very shortly stalked,  $\frac{1}{2}$ -1 in. long, oblong or oblong-lanceolate, entire or slightly serrate, 1-5 nerved from the base. Flowers axillary and in terminal racemes, filiform. Calyx  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, deeply divided; segments linear-lanceolate, acute. Corolla twice as long as the calyx, blue or white. Capsule ovoid-oblong, acute, usually exceeding the calyx.

Common within the area in wet ground, flowering during the rainy season. DISTRIB.: Throughout the greater part of India, but not in Ceylon, extending to Siam and Trop. Africa. Very similar in general appearance to *Vandellia pyxidaria*, but the shorter stamens reduced to staminodes and the longer and acute capsules distinguish it from the latter.

# 15. BONNAYA, Link & Otto; Fl. Brit. Ind. iv, 284.

Annual glabrous herbs. Leaves opposite, entire or serrate, obscurely penninerved. Flowers solitary, axillary, or often passing into terminal racemes, bracteoles none. Calyx 5-partite; segments narrow, partly imbricate. Corolla 2-lipped, tube cylindric; upper lip outside, erect, concave, 2-fid.; lower larger, spreading, 3-lobed. Stamens, the 2 upper only perfect, sub-included, filaments filiform, anthers connivent, cells divaricate; staminodes 2, entire, obtuse, glandular. Ovary 2-celled, style slender, stigma 2-lamellate. Fruit a narrow exserted septicidal capsule; valves entire, separating from the placentiferous septum. Seeds many, rugose.—Species 8, in Asia and Trop. Africa.

Leaves deeply and closely serrate . . . 1. *B. brachiata*.

Leaves narrower with shallow distant teeth, the lower leaves often sub-entire . . . 2. *B. veronicæfolia*.

**1. B. brachiata**, Link & Otto Ic. Pl. Sel. i, 25, t. 11; F.B.I. iv, 284; Collett Fl. Siml. 354; Prain Beng. Pl. 770; Cooke Fl. Bomb. ii, 297. *Gratiola serrata*, Roxb. Fl. Ind. i, 139.

A small rigid glabrous herb, 3-10 in. high. Stem 4-sided, the lowest branches decumbent below. Leaves sessile,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, oblong, obtuse or subacute, closely and deeply spinose-serrate, glabrous. Flowers shortly pedicelled, forming terminal racemes; pedicels about equalling the calyx, rigid; bracts lanceolate, lowermost often dentate. Calyx about  $\frac{1}{2}$  in. long, deeply divided; segments narrow, aristate.

*Corolla*  $\frac{1}{2}$  in. long, pink or white. *Staminodes* short, pubescent. *Capsules*  $\frac{1}{2}$  in. long, narrowly cylindric, diverging, acute, glabrous. *Seeds* minute, usually truncate at both ends.

Abundant within the area, flowering during the rainy season. **DISTRIB.:** throughout India and in Ceylon; Himalaya up to 5,000 ft., extending to the Malay Peninsula, Java, China and the Philippines.

2. *B. veronicæfolia*, Spreng. Syst. Veg. i, 41; F.B.I. iv. 285; Prain Beng. Fl. 770; Cooke Fl. Bomb. ii, 298. *Gratiola veronicæfolia*, Retz; Roxb.; Fl. Ind. i, 138.

A decumbent or creeping herb. *Stem* 4-sided; branches ascending, often rooting at the nodes. *Leaves*  $\frac{1}{2}$ - $1\frac{1}{4}$  in. long, oblong or oblong-lanceolate or obovate, rather distantly serrate or the lower sometimes subentire. *Flowers* in terminal and axillary racemes. *Calyx* deeply divided; segments linear-lanceolate, acute. *Corolla*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, violet streaked with purple. *Capsules* slender, erect or somewhat spreading, about twice as long as the calyx.

Very common all over the area, flowering during the rainy and cold seasons. **DISTRIB.:** Throughout India and in Ceylon, W. Himalaya up to 5,000 ft., extending to Malay Pen. and Islands, Siam, China and the Philippines. A very variable species.

#### 16. GLOSSOSTIGMA, Arn.; Fl. Brit. Ind. iv, 237.

Minute glabrous creeping herbs. *Leaves* opposite or in fascicles, linear or spatulate, entire. *Flowers* minute, axillary, solitary, bracteoles none. *Calyx* campanulate, obtusely 3-4-lobed. *Corolla* shortly tubular; lobes 5, subequal, spreading. *Stamens* 2 (in the single Indian species) or 4, filaments filiform; anther-cells diverging, their tips confluent. *Ovary* perfectly or imperfectly 2-celled, style short; stigma dilated, spatulate, recurved. *Fruit* a small included loculicidal capsule; valves entire, separating from the columnar placentiferous axis. *Seeds* small, ovoid.—Species 3, all Australian, one of which extends to Asia and Africa, and another occurs in New Zealand.

*G. spatulatum*, Arn. in Nov. Act. Nat. Cur. xviii. 355; F.B.I. iv, 288; Prain. Beng. Fl. 772; Cooke Fl. Bomb. ii, 299. *Limosella diandra*, Roxb. Fl. Ind. iii, 91.

A minute tufted herb with creeping stems and rooting at the nodes, the branches intricately interwoven. *Leaves*  $\frac{1}{10}$ - $\frac{1}{4}$  in. long, narrowly spatulate, tapering into a flat petiole of variable length. *Pedicels* slender usually shorter than the leaves. *Calyx* about  $\frac{1}{2}$  in. long.

slightly enlarged in fruit; lobes 3, shallow, broadly ovate. *Corolla* bluish, tube included within the calyx. *Stamens* 2. *Capsule* about as long as the calyx.

Somewhat abundant within the area, on margins of stagnant water as at Saharanpur (Royle), Moradabad (T. Thomson) and also near Jhansi in Merwara (Duthie). *DISTRIB.*: Mt. Abu in Rajputana, Behar, Konkani to S. India and Ceylon. It has been collected also in Trop. Africa (Sengambia) and in Australia. Very similar in habit to *Limosella aquatica* and *Microcarpa mucosa*. The latter may very possibly be found within the area of this flora if carefully searched for in similar localities. It may be distinguished by its neatly 5-lobed, tubular calyx.

## 17. SCOPARIA, Linn.; Fl. Brit. Ind. iv, 289.

Branched glabrous or pubescent herbs or undershrubs. *Leaves* opposite or whorled, entire or toothed, punctate. *Flowers* small, white or yellow, axillary, solitary or 2-nate, bracteoles none. *Calyx* campanulate, 4-5-partite, imbricate in bud. *Corolla* rotate, 4-lobed, throat densely bearded; lobes obtuse, subequal. *Stamens* 4, subequal, filaments filiform; anthers subsagittate; cells distinct, parallel or diverging. *Ovary* 2-celled; style subclavate, stigma notched or truncate. *Fruit* a small globose or ovoid septicidal capsule; valves membranous, entire; margins inflexed, separating from the placentiferous axis. *Seeds* many, obovoid, angled, serotuberculate.—Species 5 or 6, all American, one of which is sporadic in Asia, Africa and Australia.

*S. dulcis*, Linn. *Sp. Pl.* 116; *F.B.I.* iv, 289; *Prain Beng. Pl.* 773; *Cooke Fl. Bomb.* ii, 310.

A glabrous leafy undershrub, up to 3 ft. high; branches many, erect or ascending. *Leaves* opposite or ternate, 1-2 in. long, lanceolate or elliptic-lanceolate, or obtuse, shortly petioled, margins serrate. *Flowers* many, in terminal panicles; pedicels  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, slender, rigid. *Calyx* 4-partite, segments oblong. *Corolla* white,  $\frac{1}{2}$  in. in diam., tube very short. *Capsule* globose,  $\frac{1}{2}$  in. in diam.

Often met with as a weed of cultivated ground, more especially in the sub-Himalayan tracts of Rohilkhand and N. Ondh. *Flowers* March-June. *DISTRIB.*: Abundant all over Bengal where, according to Clarke, it was unknown in Roxburgh's time. The first record of its occurrence in Bengal was, by Voigt in 1845. It has been found recently by Woodrow in a salt swamp near Bombay. The plant is a native of Trop. America, whence it has spread more or less throughout the tropics.

## 18. VERONICA, Linn.; Fl. Brit. Ind. iv, 291.

Herbs or shrubs, rarely trees. *Leaves* opposite, the cauline or all rarely alternate. *Flowers* usually blue or purple, solitary, axillary or in terminal or axillary racemes, bracts usually conspicuous, bracteoles none. *Calyx* 4-5-partite, the lower segments connate, upper (if present) smaller. *Corolla* rotate or shortly salver-shaped; lobes 4 or 5, spreading, the lateral, or one of them, outside in bud. *Stamens* 2, exserted, adnate to corolla-tube by the sides of the upper lobe; anther-cells confluent at their tips. *Ovary* 2-celled, stigma subcapitate; ovules many or few, rarely only 2 in each cell. *Fruit* a compressed or turgid 2-grooved capsule, dehiscing in various ways. *Seeds* many or few, smooth or rugose, sometimes winged.—Species over 200, mostly in temperate and alpine regions of both hemispheres, less frequent in America.

Leaves oblong or linear-oblong, flowers in axillary racemes. An erect perennial usually glabrous herb . . . . . 1. *V. Anagallis*.

Leaves cordate-ovate or orbicular, flowers in terminal racemes. A prostrate pubescent annual 2. *V. agrestis*.

1. *V. Anagallis*, Linn. *Sp. Pl.* 12; *Royle Ill.* 290; *F.B.I.* iv, 293; *Collett Fl. Siml.* 357; *Prain Beng. Pl.* 773; *Cooke Fl. Bomb.* ii, 301. *V. punctata*, Buch.-Ham. in *Don Prod.* 93. *V. Anagallis*, var. *punctata*, *F.B.I. l.c.*; *Prain Beng. Pl. l.c.*

An erect more or less succulent glabrous herb, 3-18 in. high. *Stems* hollow, creeping below and stoloniferous. *Leaves* sessile or the lowest shortly stalked, 2-6 in. long, oblong-lanceolate, or linear-oblong, entire or serrate, base usually cordate. *Flowers* in lax axillary racemes, 3-6 in. long; pedicels filiform, spreading, longer than the linear-lanceolate bracts. *Calyx* about half as long as the pedicels, divided to the base; segments ovate, subacute. *Corolla*  $\frac{1}{2}$ - $\frac{1}{4}$  in. across, pale-purple or white. *Capsules* compressed,  $\frac{1}{8}$ - $\frac{1}{6}$  in. long, orbicular or orbicular-oblong, emarginate, glabrous.

Abundant in wet places. *Flowers* in the cold season. *DISTRIB.*: Over the greater part of India, and up to 9,000 ft. on the Himalaya and at much higher elevations in Baltistan. Found also in Europe, N. America, and in nearly all warm and temperate regions of the world.

2. *V. agrestis*, Linn. *Sp. Pl.* 13; *Royle Ill.* 290; *F.B.I.* iv, 294; *Collett Fl. Siml.* 357; *Prain Beng. Pl.* 773.

A prostrate more or less pubescent annual. *Stems* spreading, 6-18 in. long, much-branched. *Leaves* shortly petioled,  $\frac{1}{2}$ -1 in. long, broadly ovate-cordate, or orbicular, coarsely crenate-serrate. *Pedicels* axillary

solitary, about as long as the leaves, decurved in fruit. *Sepals*  $\frac{1}{4}$  in. long, ovate, obtuse, ciliate. *Corolla* shorter or longer than the sepals, blue or white. *Capsule*  $\frac{1}{4}$  in. in diam.; lobes globose, 4-10-seeded.

A common weed within the area, appearing during the cold season in gardens and cultivated ground. *DISTRIB.*: Punjab Plain and W. Himalaya from Kashmir and Baltistan to Kumaon up to 9,000 ft., also in C. Bengal, extending to Europe, N. Africa, China, Japan and the Loochoo Islands.

### 19. BUCHNERA, Linn.; Fl. Brit. Ind. iv, 297.

Rigid annual herbs, black when dry. *Leaves*, the lower ones, opposite and broad, upper alternate and narrow. *Flowers* sessile, axillary or in bracteate spikes, 2-bracteolate. *Calyx* tubular, 5-toothed, 10-nerved and sometimes 5-ribbed. *Corolla-tube* straight or nearly so, slender; lobes 5, flat, subequal, spreading, 2 upper inside in bud. *Stamens* didynamous, included; anthers 1-celled, vertical, dorsifixed, bases obtuse, connective sometimes mucronate. *Ovary* 2-celled, style thickened or clavate upwards, stigma entire or notched. *Fruit* an oblong loculicidal capsule; valves coriaceous, entire, septiferous, separating from the placentas. *Seeds* many, obovoid or oblong, reticulated.—Species about 78, in the warmer regions of both hemispheres.

*B. hispida*, Buch.-Ham. in Don Prod. 91; F.B.I. iv, 298; Collett Fl. Siml. 353; Prain Beng. Pl. 774; Cooke Fl. Bomb. ii, 301.

An erect hispid herb, 6-18 in. high. *Stem* slender, often branched above. *Leaves* sessile or obscurely petioled; the lower crowded, 1-2 in. long, obovate or oblong; the upper usually longer and narrower. *Flowers* distant, sessile in the axils of narrow bracts and forming terminal spikes. 6-10 in. long; bracteoles small, subulate. *Calyx*  $\frac{1}{2}$ - $\frac{3}{4}$  in long, tubular, hispid; teeth lanceolate, acute. *Corolla* pale-purple or white; tube, slender, cylindric, longer than the calyx, hairy within. *Capsule* oblong, shorter than the calyx.

Frequent in grassy places on the Siwalik range and throughout the sub-Himalayan tracts eastwards. *Flowers* July-Oct. *DISTRIB.*: W. and C. Himalaya from Kashmir to E. Nepal, up to 9,000 ft., and from Chota Nagpur, C. India and the Konkan to S. India; also in Madagascar and Trop. Africa.

### 20. STRIGA, Lour.; Fl. Brit. Ind. iv, 298.

Usually scabrid herbs, turning blackish when dry. *Leaves*, the lower, opposite; upper alternate, linear, entire, rarely toothed, sometimes reduced to scales. *Flowers* axillary or the upper in bracteate.

spikes, bracteoles usually 2. *Calyx* 5-toothed or -fid.; tube with 4 or 5 or 15 strong nerves. *Corolla* 2-lipped; tube slender, abruptly incurved at or above the middle; limb spreading; upper lip inside in bud, usually short, notched or 2-fid., lower 3-lobed. *Stamens* didynamous, included; anthers 1-celled, vertical, dorsifixed, bases obtuse, connective sometimes mucronate. *Ovary* 2-celled, style thickened upwards, stigma simple. *Fruit* an oblong or subglobose capsule; valves entire, septiferous, separating from the placentas. *Seeds* many; reticulated.—Species about 34, in the warmer parts of Asia, Africa and Australia.

*Calyx* 4-5-ribbed, with one rib running to the apex of each calyx-tooth:—

- A reddish-brown root-parasite with tuberous rootstock, leaves scale-like, corolla pink . 1. *S. orobanchoides*.  
 A green non-parasitic plant, rootstock not tuberous, leaves linear, corolla white . 2. *S. densiflora*.

*Calyx* 10-15-ribbed:—

- Ribs of calyx usually 10, the secondary ones terminating in the sinus, corolla yellow . 3. *S. lutea*.  
 Rib of calyx 15, the secondary ones continued up the sides of adjacent calyx-teeth and beyond the sinus, corolla white . 4. *S. enphrasioides*.

**I. *S. orobanchoides*, Benth. in Hook. Comp. Bot. Mag. i, 361, t. 19; F.B.I. iv, 299; Cooke Fl. Bomb. ii, 302. Buchnera orobanchoides, R. Br.; Royle Ill. 291.**

A small glabrous or puberulous herb, 6-10 in. high, usually parasitic; rootstock tuberous. *Stems* stout or slender, simple or branched, *Leaves* scale-like, ovate-oblong, acute, reddish-brown as are the stems, passing gradually into floral bracts. *Flowers* sessile, arranged in erect usually dense spikes; bracts shorter than the calyx, ovate-lanceolate, acute; bracteoles narrower, ciliate. *Calyx* 5- or 4-ribbed, less than  $\frac{1}{2}$  in. long; teeth 5 or 4, shorter than the tube, lanceolate, acuminate and tipped with a bristle. *Corolla* usually pink with a white spot at the base of each lobe; tube about  $\frac{1}{2}$  in. long, incurved above the middle, hairy in the throat; limb about  $\frac{1}{4}$  in. across. *Capsule* about  $\frac{1}{4}$  in. long, oblong-ellipsoid.

Dehra Dun (Royle), Ajmere, parasitical on the roots of *Lepidagathis Hamiltoniana* (Duthie). Flowers in Oct. **DISTRIB.:** Rajputana, on Mt. Abu, Sind, Konkan, Deccan, Gujarat to S. India and Ceylon; also in Arabia, Socotra, Cape de Verde Islands, and in Trop. and S. Africa. Trimen says that in Ceylon the plant is sometimes green, and then the flowers are white.

**2. *S. densiflora*, Benth. in Hook. Comp. Bot. Mag. i, 363; F.B.I. iv, 299; Prain Beng. Pl. 775; Cooke Fl. Bomb. ii, 303.**



An erect scabrid or strigose herb, 6-18 in. high. *Stem* simple or branched, stout or slender, rootstock not tuberous. *Leaves* sessile, erect,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, linear, acute, passing into floral bracts. *Flowers* in slender spikes, bracts longer than the calyx; bracteoles linear, acute, ciliate. *Calyx*  $\frac{1}{3}$  in. long, lengthening in fruit, 5-ribbed; teeth lanceolate-subulate, ciliate. *Corolla* white; tube nearly  $\frac{1}{2}$  in. long, incurved above the middle, throat hairy within, limb about  $\frac{1}{4}$  in. across, upper lip much shorter than lower. *Capsule*  $\frac{1}{2}$  in. long, oblong-obovoid, included within the calyx.

Saharanpur (Royle), banks of Ganges near Benares (Madden). Flowers during the rains and the cold season. **DISTRIB.:** N. Bengal and from Gujarat, Konkan and the Deccan southwards.

3. *S. lutea*, Lour.. *Fl. Cochinch.* 22; *F. B. I.* iv, 299; *Collett Fl. Siml.* 358; *Prair Beng. Pl.* 775; *Cooke Fl. Bomb.* ii, 303. *Buchnera asiatica*, Linn; *Roxb. Fl. Ind.* iii, 31.

A slender erect herb, 6-18 in. high, simple or fastigiately branched, scabrid or villous. *Leaves* sessile,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, linear, rough. *Flowers* in elongated usually interrupted spikes 2-6 in. long; bracts usually longer than the calyx. *Calyx* 10-ribbed,  $\frac{1}{2}$  in. long, narrowly tubular in flower, widening in fruit; teeth 5, subequal. *Corolla* about  $\frac{1}{2}$  in. long, usually yellow or sometimes white pink or purple; tube slender, cylindric, incurved at the apex; upper lip slightly emarginate, reflexed, much shorter than lower. *Capsule* shorter than the calyx, oblong-ellipsoid, grooved.

Grassy places in Dehra Dun; also in Rohilkhand, Bundelkhand and in the sub-Himalayan tracts of N. Oudh. **DISTRIB.:** W. Himalaya up to 6,000 ft., Bengal, Punjab, Sind, W. and S India to Ceylon; extending to the Malay Pen., Siam, Java, China, Arabia, Africa and Mascarene Islands.

4. *S. euphrasioides*, Benth. in *Hook. Comp. Bot. Mag.* i, 364; *F. B. I.* iv, 299; *Prair Beng. Pl.* 775; *Cooke Fl. Bomb.* ii, 303. *Buchnera euphrasioides*, Vahl; *Roxb. Fl. Ind.* iii, 32. *Vern. Aggia* (Bundelkhand).

Very variable in habit, sometimes only 4-6 in. high and with a simple filiform stem, or a much-branched stout herb up to 2 ft. high. *Leaves* sessile, 1-2 in. long, often with 1 or 2 teeth on each margin, scabrous. *Flowers* sessile or nearly so, in long often interrupted spikes or racemes. *Calyx*  $\frac{1}{2}$  in. long, campanulate; ribs 15, strong and scabrous; segments linear-subulate, acute, usually reflexed in fruit; each segment with one rib passing along the centre to the apex, the secondary ones not ending in the sinus but continuing to the apex of each segment along the edges which thus become strongly margined. *Corolla* white,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, tube exserted, the much-incurved upper portion hairy within. *Capsule*  $\frac{1}{4}$  in. long.

Moradabad (T. Thomson), Bundelkhand (Edgeworth Duthie, Mrs. Bell). Parasitic on and said to be destructive to crops of *juar* (*Andropogon Sorghum*). Flowers during the cold season. **DISTRIB.:**—Plains of

Punjab and Bengal, Himalaya up to 4,000 ft. in Kumaon; also on the Khasia Hills and in Burma, in W. C. and S. India to Ceylon, extending to Java. Very injurious as a parasite to sugar cane in the Central Provinces.

## 21. CENTRANTHERA; R. Br., Fl. Brit. iv, 300.

Annual rigid scabrid herbs. *Leaves* opposite or the upper alternate, oblong or linear, obtuse, entire or toothed. *Flowers* axillary or in bracteate spikes or racemes, bracteoles 2. *Calyx* compressed, spathaceous, split on one side, entire or shortly 3-5-lobed. *Corolla-tube* long, incurved and dilated above, limb oblique; lobes 5, broad, subequal, spreading, the two upper inside in bud. *Stamens* didynamous, included; anthers meeting in pairs, cells transverse, bases spurred or mucronate, one cell often empty; stigma tongue-shaped, acute. *Fruit* an ovoid or subglobose loculicidal capsule; valves entire, carrying away the placentas. *Seeds* very many, oblong, cuneate; testalax, reticulate.—Species 4, in tropical and sub-tropical Asia, the Malay Archipel. and in Australia.

*C. hispida*, R. Br. *Prod.* 438; Royle *Ill.* 291; F.B.I. iv, 301; Collett *Fl. Siml.* 359; Prain *Beng. Pl.* 776; Cooke *Fl. Bomb.* ii, 308. *C. nepalensis*, Don *Prod.* 88. *Digitalis stricta*, Roxb. *Fl. Ind.* iii, 99.

An erect hispid and somewhat hoary herb, 1-2 ft. high. *Stem* stout simple or more or less branched above. *Leaves* sessile or nearly so,  $\frac{1}{2}$ -1 $\frac{1}{2}$ -in. long, linear or elliptic-oblong, the lower opposite, the upper alternate, passing into floral bracts, hispid on both surfaces with tubercled hairs. *Flowers* rather large for the size of the plant, arranged in terminal bracteate spikes. *Calyx*  $\frac{1}{2}$  in. long ovate, inflated, narrowed towards the mouth. *Corolla*  $\frac{3}{4}$  in. long or more, funnel-shaped, purplish or white, lobes rounded. Filaments softly hairy. *Capsule*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, broadly ovoid-oblong, grooved, subrugose.

Grassy places in Dehra Dun and in the sub-Himalayan tracts of Rohilkhand and N. Oudh. *Flowers* June-Oct. *DISTRIB.*: Throughout India and in Ceylon, ascending to 4,000 ft. on the W. Himalaya; also in Burma, Java, China, the Philippines and Australia.

## 22. SOPUBIA, Buch.-Ham.; Fl. Brit. Ind. iv, 302.

Erect herbs. *Leaves* opposite, or the upper alternate, narrow, often lacinate. *Flowers* in spikes or racemes, bracts leafy, bracteoles 2. *Calyx* campanulate; lobes 5, narrow, valvate. *Corolla* funnel-shaped; tube short, dilated at the throat; lobes 5, broad, spreading.

subequal, the 2 upper inside in bud. *Stamens* didynamous, anthers of both sets of stamens meeting in pairs, one cell of each perfect and ovoid, the other empty and stipitate. *Orary* 2-celled; stigma thickened, tongue-shaped, obtuse. *Fruit* an ovoid or oblong loculicidal capsule; valves entire or 2-fid., separating from the placentiferous septum. *Seeds* numerous, testa somewhat lax.—Species about 27, in Africa, Madagascar, India, China, Malaya and Australia.

*S. delphinifolia*. *G. Don, Gen. Syst.* iv, 569; *F.B.I.* iv, 572; *Wats E.D.*; *Prain Beng. Pl.* 777; *Cooke Fl. Bomb.* ii, 305. *Gerardin delphinifolia*, *Roxb. Fl. Ind.* iii, 99.

A tall erect much-branched herb, 1-5 ft. high. *Stem* 4-sided, grooved, glabrous or scaberrulous, often spotted with purple. *Leaves* pinnatisect, 1-1½ in. long the uppermost (bracts simple, segments filiform. *Flowers* subsessile, axillary, solitary or in few-flowered terminal racemes; bracteoles ½ in. long, filiform, pedicels slender. *Calyx* ½ in. long, tube strongly ribbed; teeth linear-subulate, erect. *Corolla* rose-coloured, 1-1½ in. long, limb ½ in. across; lobes broad, spreading. *Filaments* hairy. *Capsule* as long as the calyx, oblong-ellipsoid.

Grassay places near Agra (Munro), Bundelkhand (Edgeworth). Flowers in the wet and cold seasons. *Districts*: Behar, Cota Nagpur, Konkan, Deccan and south to Ceylon. The juice of this plant is sometimes used medicinally.

### 23. LINDENBERGIA, Lehm.; Fl. Brit. Ind. iv, 261.

Annual or perennial herbs. *Branches* erect straggling, or ascending, rarely woody below. *Leaves* opposite or the upper alternate, toothed. *Flowers* yellow, axillary, passing into terminal spikes or racemes; bracts leaf-like, bracteoles none. *Calyx* campanulate, 5-fid, lobes leaf-like. *Corolla* 2-lipped, tube cylindric; upper lip short, notched or 2-fid, innermost in bud; lower larger, 3-lobed, spreading, throat and lip with a 2-plicate palate. *Stamens* 4, didynamous, included; anther-cells separate, stipitate, all fertile. *Fruit* a 2-grooved loculicidal capsule; valves entire, separating from the placentiferous dissepiment. *Seeds* many, minute.—Species 14, Indian, Malayan and S. African.

Glabrous or nearly so with stout erect stems

2-3 ft high, calyx longer than the bracts . 1. *L. macrostachya*.

Glandular-pubescent herbs with slender stems, calyx shorter than bracts.

Leaves shortly petioled, flowers sessile . 2. *L. polyantha*.

Leaves long-petioled, flowers pedicelled . 3. *L. urticifolia*.

1. *L. macrostachya*, Benth. *Scroph. Ind.* 22; *F. B. I.* iv, 262; *Collett Fl. Siml.* 351.

A glabrous or slightly pubescent herb. *Stems* 2-3 ft. high, erect and usually stout. *Leaves* 1-3 in. long, ovate or oblong-lanceolate, serrate, petioles less than half the length of blade. *Flowers*  $\frac{1}{2}$  in. long, unilateral, usually crowded in erect rigid spikes. *Calyx* longer than the bracts; lobes short, acute. *Capsule* about  $\frac{1}{2}$  in. long, pubescent.

Siwalik range and sub-Himalayan tracts eastwards to Gorakhpur; also in Merwara. *Flowers* April and May. *DISTRIB.*: Western Himalaya up to 4,000 ft., Punjab Plain and Shan Hills, extending to Siam, Tonkin and China. Closely allied to *L. philippinensis*, but less hairy and with much shorter petioles.

2. *L. polyantha*, Royle ex Benth. *Scroph. Ind.* 22; *F. B. I.* iv, 262; *Prain Beng. Pl.* 760; *Cooke Fl. Bomb.* ii, 307.

A densely glandular-villous annual. *Stems* erect or ascending, leafy, 12-20 in. long, branching from the base. *Leaves* very shortly petioled, about  $\frac{1}{2}$ -in. long, ovate or elliptic, acute, margins crenate-serrate. *Flowers* many, unilateral, arranged in axillary and terminal leafy spikes. *Calyx*  $\frac{1}{4}$ -in. long, gland-villous; lobes oblong, obtuse. *Corolla* yellow, twice as long as the calyx, hairy outside, upper lip pubescent, mid-lobe of lower lip oblong, rounded at the apex. *Ovary* ovoid, pubescent. *Capsule*  $\frac{1}{4}$ -in. long, hairy at the apex.

Common within the area, on walls and banks. *DISTRIB.*: Throughout India, ascending to 6,000 ft. on the Himalaya; also in Baluchistan.

3. *L. urticifolia*, Link and Otto Ic. *Pl. Rar. Hort. Berol.* t. 48; *F. B. I.* iv, 262; *Collett Fl. Siml.* 352; *Prain Beng. Pl.* 760; *Cooke Fl. Bomb.* ii, 307. *Stemodia ruderalis*, Vahl; *Roxb. Fl. Ind.* iii, 94.

An annual, more or less glandular-hairy. *Stems* 4-10 in. high, simple or branched, often tufted, brittle when dry. *Leaves*  $\frac{1}{2}$ -2 in. long, broadly ovate, crenate-serrate, usually gland-villous on both sides; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* unilateral, shortly pedicelled, solitary or in pairs in the axils of large leaves, sometimes forming axillary or terminal leafy racemes. *Calyx*  $\frac{1}{4}$ -in. long, densely gland-villous; lobes triangular-oblong, obtuse. *Corolla* yellow, 6 in. long, hairy outside, tube tinged with red or purple, throat hairy, mid-lobe of lower lip narrow. *Ovary* pubescent round the apex. *Capsule*  $\frac{1}{2}$ -in. long, oblong, hairy above.

Walls and banks, abundant within the area. *DISTRIB.*: Throughout India and up to 6,000 ft. on the Himalaya, extending to Afghanistan. Not found in Ceylon.

## LXXX.—OROBANCHACEÆ.

Leafless brown, white or reddish root-parasites containing little or no chlorophyll. *Stem* usually simple, stout or slender, scaly. *Flowers* 2-sexual, irregular, solitary or in spikes or racemes. *Calyx* spathaceous or 2-lipped, with 4 or 5 free or connate segments. *Corolla* hypogynous, curved, usually distinctly 2-lipped, or sometimes with 5 subequal lobes; upper lip often arched, lower 3 fid., throat often with 2 villous folds. *Stamens* didynamous, inserted on the corolla-tube; anthers 1- or 2-celled; cells frequently spurred at the base, opening by slits or apical pores, one cell often imperfect. *Disk* usually obscure. *Ovary* of 2 (rarely 3) carpels, 1 or (rarely) 2-celled; ovules usually many, anatropous, on 2 (rarely 3) pairs of free or confluent parietal placentas which sometimes ultimately reach the centre of the ovary. *Fruit* a capsule, usually 1-celled; valves 2, rarely 3. *Seeds* usually many, testa pitted or reticulated, albumen fleshy, embryo often undivided.—Species about 150, in temperate and tropical regions.

Corolla-lobes broad, subequal:—

- |  |               |
|--|---------------|
| Calyx spathaceous, anther-cells unequal                | 1. ÆGINETIA.  |
| Calyx tubular-campanulate, 5-lobed; anther-cells equal | 2. CISTANCHE. |
| Corolla 2-lipped, upper lip 2-lobed, lower 3-lobed     | 3. OROBANCHE. |

## 1. ÆGINETIA, Linn.; Fl. Brit. Ind. iv, 320.

Leafless herbs with branched or simple naked or scaly scapes or stems. *Flowers* few, large solitary or corymbose, bracteoles none. *Calyx* spathaceous, split in front nearly to the base. *Corolla* broadly tubular, incurved, obscurely 2-lipped; lobes 5, broad, spreading, the 2 upper connate. *Stamens* didynamous, included; anthers meeting in pairs, each with 1 perfect cell adnate to the filament and not spurred at the base, the other cell absent from the upper pair, the absent cell in the lower pair represented by an empty clavate and deflexed spur. *Ovary* 1-celled; placentas large, 2- or more-lobed, filling the cavity; ovules very many, covering the whole placental surface; style slender; stigma large, peltate. *Fruit* a 2-valved capsule. *Seeds* many, minute, pitted.—Species 3 in Tropical and Sub-tropical Asia.

Scape slender, naked, corolla purple, placentas multi-

- |  |                |
|--|----------------|
| fixed  | 1. Æ. indica.  |
| Scape, short, stout, bracteate; corolla-tube yellow, |                |
| mouth blue, placentas 2 lamellate                    | 2. Æ. peduncu- |
|  | lata.          |

1. *Æ. indica*, Linn. Sp. Pl. 632; Roxb.; Fl. Ind. iii, 30; Royle Ill. 292; F. B. I. iv, 320; Prain Beng. Pl. 778; Cooke Fl. Bomb. ii, 311.

Whole plant tinged with purple, turning brown when dry. Rhizome small, tuberous, emitting many short branching coral-like roots. Scapes erect, slender, solitary or several, 6-12 in. high, with usually a few scales at the base. Flowers solitary on the top of each naked scape, nodding. Calyx  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long, closed in bud, pointed, glabrous. Corolla purple; tube 1-1 $\frac{1}{2}$  in. long, curved, inflated; limb  $\frac{1}{2}$ -1 in. across; lobes small, equal, rounded, margins fimbriate. Anthers of lower stamens with thick blunt dorsal spurs. Placentas multifid. Capsule  $\frac{3}{4}$  in. long, ovoid, beaked, enclosed in the persistent calyx and corolla. Seeds pale-yellow, testa loose and hyaline.

Dehra Dun, in shady ravines. Flowers during the rainy season. DISTRIB. Throughout the greater part of India from the W. Himalaya in Kumaon up to 3,500 ft., also in Nepal, Assam and on the Khasia Hills and southwards to Travancore and Ceylon, extending to Burma, China, Japan and the Philippines.

2. *Æ. pedunculata*, Wall. Pl. As. Rar. iii, 13, t. 219; F. B. I. iv, 320; Prain Beng. Pl. 778. *Orobanche pedunculata*, Roxb.; Fl. Ind. iii, 29. *O. acaulis*, Roxb.; Fl. Ind. iii, 29.

Whole plant red or yellow. Stem very short, buried in the soil. Scape short, stout, very fleshy, many-flowered; bracts  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, ovate, obtuse. Calyx 1 $\frac{1}{2}$ -2 $\frac{1}{2}$  in. fleshy, red turning to yellowish-white, obtuse, acute or shortly beaked, very mucilaginous. Corolla-tube equalling the calyx, yellowish; limb violet, lobes crenate or erose. Stigma broadly cordiform, peltate. Capsule ovoid. Seeds brown.

Sub-Himalayan tracts; Moradabad (T. Thomson), parasitic on roots of the Khas-khas grass (*Vetiveria zizanioides*). Flowers during the rainy season. DISTRIB. Throughout the greater part of India from near Marree (W. Himalaya) to Sikkim and Assam, and from Bengal (in hills) to Travancore and Ceylon (on roots of grasses); also in Upper Burma, Malay Peninsula and Islands and Cochin China.

## 2. CISTANCHE, Hoffm. and Link; Fl. Brit. Ind. iv, 324.

Scapigerous herbs, scape or stem simple, scaly. Flowers subsessile, in dense spikes, yellow violet or purple. Calyx broadly tubular-campanulate; lobes 5, subequal, obtuse. Corolla-tube long, curved, dilated above; limb spreading, oblique; lobes 5, broad subequal. Stamens 4, subexserted; anthers subtransverse, often villous; the cells equal, parallel, bases obtuse. Ovary 1-celled; placentas 4, equidistant or in pairs, stigma broad. Capsule ovoid, laterally compressed, 2-valve to the base. Seeds numerous, subglobose, reticulately punctate.—Species 12, Mediterranean region and N. Africa extending to W. and C. Asia.

*C. tubulosa*, Wight *Ind. 1420 bis*; *F. B. I. iv. 324*; *Cook's Fl. Bomb. ii. 315*. *Orobancha calotropidis*, Edgew. in *Hook. Journ. Bot. ii. 285*. Vern. *Blur pher* (Rajputana).

Whole plant yellowish or sometimes tinged with purple. Stem  $\frac{1}{2}$ -2 ft. high and as much as 2 in. in diam., not branched, densely covered with acute triangular scales  $\frac{1}{2}$ -1 in. long, glabrous or pubescent. Flowers mostly arranged in dense spikes 6-10 in. long and sometimes 3 in. in diam.; bracts lanceolate, acuminate, longer than the calyx, margins membranous; bracteoles narrower, shorter than the calyx. *Calyx*  $\frac{1}{2}$ -1 in. long; lobes rounded, about  $\frac{1}{2}$  as long as the tube; margins membranous, veined. *Corolla* yellow; tube erect, inflated above, 2 or 3 times as long as the calyx, hairy inside at the base; upper half campanulate bent outwards from the middle; lobes rounded, reflexed. Filaments hairy at the base, anthers not or scarcely apiculate. *Style* exerted, curved below the stigma. *Capule* 1 in. long, beaked.

*Ajmer* (Duthiel). Flowers during the cold season. **DISTRIB.** Plains of Panjab and Sind, extending to C. Asia and Arabia.

### 3. OROBANCHE, Linn.; *Fl. Brit. Ind. iv. 331*.

Scapigerous herbs, scapes or stems simple or branched, stout or slender, scales acute. *Flowers* in dense or lax or interrupted spikes or racemes, bracts scale-like, bracteoles 2 or none. *Calyx* unequally 4-fid., or 2-partite from back to front; segments entire or 2-fid., with rarely a fifth lobe or segment. *Corolla* 2-lipped; tube curved, dilated above, circumscissile at the base; upper lip erect, crenulate notched or 2-fid.; lower somewhat spreading, 3-lobed. *Stamens* included; anther-cells equal, parallel, usually mucronate at the base. *Disk* none or glandular. *Ovary* 1-celled; placentas 4, equidistant or in pairs; stigma funnel-shaped or peltate, or more or less 2-lobed. *Fruit* a 2-valved capsule, the valves often cohering with the style. *Seeds* very many, globose or ovoid—Species about 90, in northern or sub-tropical regions of the Old World.

Flowers without bracteoles, arranged in dense spikes . . . . . 1. *O. cernua*.  
Flowers with 2 bracteoles, arranged in rather lax spikes . . . . . *O. ægyptiaca*.

1. *O. cernua*, *Jussl. II. Hipp. 152*; *F. B. I. iv. 325*; *Prain Beng. Pl. 778*. *O. indica*, *Wall. Cat. 9636* (not of Buch.-Ham.).

Stems 1 or more, stout or slender, 6-12 in. high, pale-brown or bluish scales ovate, upper acute or acuminate. *Spikes* dense, about half as long as the stem or longer. *Flowers* blue; bracts lanceolate, shorter

than the corolla, cleft to the middle; segments lanceolate, cuspidate; bracteoles none. *Corolla*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, curved outwards, glabrous or sometimes puberulous above; lobes crenate, not ciliate, the 2 upper broad; the 3 lower ovate, acuminate. *Filaments* glabrous; anther-cells acuminate, glabrous or slightly hairy. *Style* glabrous; stigmatic-lobes short, thick.

Oudh (Wallich). *DISTRIB.* W. Himalaya from Nepal to Kashmir, Baltistan and Gilgit up to 12,000 ft.; also in Bengal, C. India and C. Provinces to S. India, extending to N. Africa and Spain, occurring also in extra-tropical Australia.

2. *O. ægyptiaca*, Pers. *Syn.* ii, 181; Royle *Ill.* 181; Cooke *Fl. Bomb.* ii, 314. *O. indica*, Buch.-Ham. in Roxb. *Fl. Ind.* iii, 27; F. B. I. iv, 326; Watt *E. D.*; Prain *Beng. Pl.* 779.

Stems 4-20 in. high, usually branching from the base. *Scales* few, lanceolate, often slightly hairy. *Flowers* many, sessile or the lowest shortly stalked and forming a rather lax spike; bracts half as long as the corolla-tube, ovate or lanceolate; bracteoles filiform, shorter than the calyx. *Calyx*  $\frac{1}{2}$  in. long, 4-toothed, campanulate, pubescent, sub-membranous; teeth about equalling the tube, lanceolate from a broad base, strongly nerved down the middle. *Corolla*  $\frac{3}{4}$ -1 $\frac{1}{4}$  in. long, hairy outside, upper portion blue or lilac, whitish below; upper lip 2-lobed, lower equally 3-lobed; tube slightly curved above, constricted above the insertion of the stamens. *Filaments* hairy at the base, anthers woolly. *Capsule* oblong, acuminate, glabrous.

Abundant within the area, parasitic on various cultivated plants, often in mustard fields. *DISTRIB.* more or less throughout the plains of India, extending to Central and W. Asia. Cattle appear to be fond of this plant, and their milk is said to be improved thereby.

### LXXXI.—LENTIBULARIACEÆ.

Herbs aquatic or in wet places, often insectivorous. *Leaves* rosulate, capillary-multifid or obsolete when submerged. *Flowers* purple blue or white, irregular, hermaphrodite, arranged on 1-many-flowered simple or branched scapes or peduncles; bracts small or none, bracteoles 2 or none. *Calyx* inferior, 2-5-lobed. *Corolla* 2-lipped, spurred; upper lip usually the smaller, entire or emarginate, lower -5-lobed. *Stamens* 2, attached to the base of corolla, alternate with lobe of lower lip; filaments curved, anthers 2-celled; cells diverging, transversely confluent. *Ovary* superior, 1-celled, style short, stigma unequally 2-lobed; ovules usually many, anatropous, attached to a free basal placenta. *Fruit* a globose few- or many-seeded capsule,



opening by 2-l valves or circumscissile or bursting irregularly. *Seeds* minute, without albumen.—Species about 200, found in all parts of the world, except in arid regions.

UTRICULARIA, Linn.; Fl. Brit. Ind. iv, 328.

Herbs floating and rootless, or on wet ground and rocks, often furnished with minute bladder-like insect-traps. *Leaves* rosulate, or when submerged many-partite with capillary segments. *Flowers* on simple or branched scapes; racemes few or many-flowered, pedicels bracteate and often 2-bracteolate. *Calyx* 2-partite; lobes entire or nearly so, often enlarged in fruit. *Corolla* 2-lipped; upper lip entire or emarginate; lower larger, 3-6-lobed; tube with a straight or curved spur. For characters of *stamens*, *ovary*, *fruit* and *seeds* see the family.—Species over 100, in the tropical and temperate regions of both hemispheres.

Inflorescence held up above water by a whorl of floats on the peduncle . . . . . 1. *U. stellaris*.

Inflorescence without floats on the peduncle:—

Peduncles stout; pedicels reflexed in fruit, bearing usually more than 3 flowers; seeds not or scarcely winged . . . . . 2. *U. flexuosa*

Peduncles slender, pedicels erect in fruit, bearing 1-3 flowers; seeds distinctly winged . . . . . 3. *U. exoleta*.

1. *U. stellaris*, Linn. f. *Suppl. 86*; Roxb. *Fl. Ind. i*, 143; F. B. I. iv, 328; Prain *Beng. Pl.* 780; Cooke *Pl. Bomb. ii*, 316.

An aquatic herb. Stolons and leaves floating under the surface of the water. *Stolons* long and usually rather slender, sparingly branched. *Leaves*  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, often in whorls of four, pinnately divided into capillary segments, each primary segment furnished near the base with a small roundish bladder, the mouth of which is truncate. *Racemes* erect, slender, few-12-flowered, rising above the surface of the water; peduncles 1-8 in. long, each suspended by a whorl of spongy floats attached about  $\frac{1}{2}$  in. below the lowest flower, each float tipped with a tuft of filiform pinnae; bracts small, ovate, obtuse, bracteoles none; pedicels  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, thickened, usually deflexed in fruit. *Calyx*  $\frac{1}{10}$ - $\frac{1}{8}$  in. long; segments nearly equal, suborbicular, enlarged in fruit. *Corolla* yellow,  $\frac{1}{4}$  in. in across; upper lip rounded, lower subquadrate; spur a little shorter than the lower lip, stout, blunt, somewhat curved. *Capsule* globose,  $\frac{1}{8}$  in. in diam. *Seeds* minute, discoid, angled; margin slightly winged, inflexed, entire.

Common in ponds and ditches and especially in the Sub-Himalayan tracts. Flowers during the rainy season. **DISTRIB.** Throughout the greater part of India and in Ceylon; extending to Malaya, Tropical and S. Africa, Madagascar and N. Australia.

2. *U. flexuosa*, Vahl Enum. i, 198; F. B. I. iv, 329; Prain Beng. Pl. 780; Cooke Fl. Bomb. ii, 316. *U. fasciculata*, Roxb. Fl. Ind. i, 143. *U. confervifolia*, Don Prod., 84.

An aquatic herb, submerged all but the inflorescence. *Stolons* stout, much branched and often very long. *Leaves*  $1\frac{1}{2}$ -3 in. long, usually in whorls of 4; segments filiform, pectinate, each pinna usually bearing at its base a small subglobose bladder which becomes black by age. *Racemes* erect, 3-8-flowered; peduncles up to 9 in. long, rather stout, naked or with a few small scales, but with no whorl of floats, the whorl of leaves however at the base of the peduncles has often its rhachis more or less inflated and thus acts as a float; bracts small, ovate; pedicels  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, deflexed in fruit. *Calyx*  $\frac{1}{8}$ - $\frac{1}{4}$  in. long; lobes subequal, ovate, obtuse or subacute, somewhat enlarged in fruit. *Corolla* yellow,  $\frac{1}{2}$ - $\frac{3}{4}$  in. across; spur nearly as long as the lower lip, conical, acute. *Capsule* subglobose,  $\frac{3}{8}$  in. long. *Seeds* as in *U. stellaris* but rather larger.

Abundant within the area in watery places, flowering in the hot season. **DISTRIB.** Throughout the greater part of India and in Ceylon, extending to Malaya, Tropical Africa and N. Australia.

3. *U. exoleta*, R. B. Prod. 439; F. B. I. iv, 329; Prain Beng. Pl. 781; Cooke Fl. Bomb. ii, 316. *U. biflora*, Roxb. Fl. Ind. i, 143 (not of Wall.) *U. pterosperma*, Edgew. in Proc. Linn. Soc. i, 352.

A small aquatic herb, usually floating, but sometimes rooting when stranded on mud. *Stolons* very slender, varying in length; branches slender, flattened. *Leaves* variable, rarely more than  $\frac{1}{2}$  in. long, not much dissected, the segments all capillary, but one or more represented by bladders, or the whole leaf transformed into a bladder, bladders obliquely ovoid, the mouth truncate, ciliate. *Racemes* 1-3-flowered; peduncles slender,  $1\frac{1}{2}$ -3 in. long, with a minute bract-like scale below the middle; pedicels slender,  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, erect in fruit; bracteoles very small, broadly ovate, truncate or rounded. *Calyx*  $\frac{1}{10}$  in. long; segments subequal, broadly elliptic, obtuse. *Corolla* yellow with darker streaks.  $\frac{1}{4}$ - $\frac{1}{2}$  in. long; spur conical, obtuse, equalling or slightly longer than the lower lip. *Capsule* globose,  $\frac{1}{8}$ - $\frac{1}{4}$  in. in diam. *Seeds* orbicular, flat, with a broad more or less crenulate wing.

Saharanpur district (Royle), and probably in many other localities within the area, especially in the Sub-Himalayan tracts, but not common. **DISTRIB.** Throughout India from the N.-W. Himalaya and Assam to Ceylon, extending to S. E. Asia, Malay Pen. and Islands and N. Australia.

*U. STRIATULA*, Smith (syn. *U. orbiculata*, Wall.; F. B. I. iv, 434) very probably occurs within the area of this flora, and should be looked for in Dehra Dun in damp shady spots. It is abundant on the Himalaya up to

8,000 ft., also in Assam and on the hills of Peninsular India; extending to Ceylon, Malaya, S. China and Trop. Africa. It is a very small terrestrial species with violet-coloured flowers, and is found usually on wet rocks. It may at once be distinguished by its orbicular or reniform persistent leaves, its very unequal calyx segments and the globose ovary.

LXXXII.—GESNERIACEÆ.

Herbs or undershrubs, often epiphytic. *Leaves* opposite alternate or solitary, undivided, entire or toothed; stipules none. *Flowers* hermaphrodite, nearly always irregular, peduncles axillary, bracteate: bracteoles usually small. *Calyx-lobes* 5, valvate or open in bud, rarely imbricate. *Corolla-tube* long or short; lobes usually 5 and imbricate in bud. *Stamens* attached to the corolla-tube, usually didynamous, sometimes 5, all or only 2 fertile, anther 2-or 1-celled. *Disk* annular or shortly cylindric or none, sometimes unilateral. *Ovary* 1-or imperfectly 2-celled, style linear, stigma capitate or 2-lobed; ovules many, anatropous, on bifid parietal sometimes subconfluent placentas. *Fruit* a 2-valved capsule or a berry. *Seeds* many, minute, fusiform or ovoid, smooth, sometimes tipped with a long hair, albumen scanty or none, embryo straight.—Species about 700, mostly in S. E. Asia, Polynesia and in Trop. America. The Indian representatives of this family all belong to the suborder *Cyrtandreae*, recognized by having the ovary free and superior. The *Eugeniaceae*, which are confined to the New World, are characterized by a more or less inferior ovary.

Capsule linear, exceeding the calyx .	1. DIDYMOCARPUS.
Capsule ellipsoid, included in the calyx.	2. RHYNCHOGLOSSUM.

1. DIDYMOCARPUS, Wall.; Fl. Brit. Ind. iv, 345.

Stemless or erect herbs. *Leaves* opposite, alternate or crowded, rarely solitary. *Peduncles* axillary, bearing few or many flowers; pedicels cymose, subumbellate or subracemose in pairs; bracts usually inconspicuous. *Calyx* small, 5-fid. or partite, lobes narrow. *Corolla* with a cylindric or ovoid tube, limb oblique or subsymmetric; lobes 5, rounded. *Stamens* included, the 2 anterior perfect with 2-3 staminodes, rarely 4 perfect; anthers cohering in pairs; cells 2, ovate, soon confluent. *Disk* cylindric or none. *Ovary* narrow, 1-celled, sessile or stipitate; stigma peltate, emarginate or unilateral; placentas

deeply inflexed, at length recurved; ovules many, crowded along the margin. *Fruit* a loculicidally 2-valved or subfollicular capsule; valves not twisted before opening, their edges revolute and concealing the seeds. *Seeds* ellipsoid, small, smooth, minutely reticulate.—Species about 90, in India, Malaya, China, Trop. Africa, Madagascar and Australia.

Stems distinct, leaf solitary.—Plant minute . 1. *D. pygmæa*.

Stems none or very short; leaves more than one, usually all radical . . . . . 2. *D. pedicellata*.

1. *D. pygmæa*, C. B. Clarke in F. B. I. iv, 345; Prain Beng. Pl. 783.

A small delicate pubescent herb. *Stems* filiform,  $\frac{1}{2}$ –2 in. long. *Leaf* solitary, sessile or nearly so, membranous, 1–2 in. long, obliquely ovate or lanceolate, obtuse at both ends; margins sinuate, scarcely crenate. *Pedicels* few, about  $\frac{1}{2}$  in. long, fascicled in the leaf-axil, bracts minute or none. *Calyx*  $\frac{1}{10}$ – $\frac{1}{8}$  in. long, densely pilose with white hairs; lobes linear, slightly enlarged in fruit. *Corolla*  $\frac{1}{4}$  in. long, tubular, shortly 5-lobed. *Stamens* 2, fertile; staminodes 2, linear,  $\frac{2}{3}$  the length of the fertile filaments. *Ovary* and style villous. *Capsule*  $\frac{1}{2}$ – $\frac{2}{3}$  in. long.

Found originally by Vicary close to a waterfall near Mhowganj in the Rewah district of C. India, and just within the south-east border of the area of this flora. *DISTRIB.* Chota Nagpur (C. B. Clarke), Nimar district of C. Prov. (Duthie). This interesting little plant has probably been often overlooked in other localities and should be searched for on wet rocks in the vicinity of waterfalls, especially in the districts of Mirzapur and Bundelkhand. In its size and general habit this plant may be compared with *Platystemma violoides* which it greatly resembles in its filiform stems, each of which bears a solitary leaf. The latter plant inhabits the W. Himalaya at elevations between 6 and 9,000 ft., and flourishes within the spray of dripping rocks.

2. *D. pedicellata*, R. Br. in Benn. Fl. Jav. Rar. 118; F. B. I. iv, 345. *D. macrophylla*, Wall. Cat. 784 (in part); Royle Ill. 294, t. 70, f. 1.

*Stems* none or very short; innovations scabrous-puberulous. *Leaves* usually all radical. 3–5 in. diam., roundly ovate, crenate-serrate, glandular-punctate. *Pedicels* longer than the calyx; bracts about  $\frac{1}{4}$  in., often shortly connate. *Calyx* funnel-shaped, about  $\frac{1}{4}$  in. long; lobes shallow, rounded. *Corolla* purple, nearly 1 in. long. *Capsule* 1–1 $\frac{1}{4}$  in. long; its stalk slender, longer than the persistent calyx.

Dehra Dnn, in damp shady ravines. Flowers in Aug. *DISTRIB.* Sub-tropical W. Himalaya from Chamba to Kumaon, up to 5,500 ft.

2. *RYNCHOGLOSSUM*, Blume; Fl. Brit. Ind. iv, 367.

Herbs, glabrous or minutely pubescent. *Leaves* alternate, elliptic, acuminate, unequal-sided, cordate on one side of the unequal base, subentire or sinuate. *Racemes* long, many-flowered; bracts none,

bracteoles minute. *Calyx* campanulate, 5-lobed. *Corolla-tube* cylindric, contracted at the mouth; limb 2-lipped; upper lip short, bifid; lower longer, 3-lobed. *Stamens* 2, perfect, included; anther connivent, 2-celled; cells ellipsoid, subparallel, slits ultimately confluent at the apex. *Ovary* 1-celled, ovoid, style linear, stigma minutely 2-lobed; placentas much intruded, divided into 2 thick lamellæ bearing many ovules on all sides. *Fruit* an ellip-oid membranous loculicidally 2-valved smooth capsule, included within the calyx. *Seeds* narrowly ellipsoid, smooth, testa minutely reticulate. —Species 2, extending from India to the Philippines.

*R. obliquum*, Blume Bijdr. 741, Var. *parviflora*, C. B. Clarke in D. C. Monogr. v. 162; F. B. I. iv. 367; Prain Beng. Pl. 754; Cooke Fl. Bomb. ii. 324.

A succulent herb up to 20 in. high, glabrous or nearly so. *Leaves* 2-6 in. long, elliptic-oblong, acuminate, unequal at the base, semicordate at the base on one side, acute on the other; lateral nerves many, parallel, curved, prominent beneath, petioles  $\frac{1}{2}$ -2 in. long. *Racemes* about 4½ in. long. Flowers solitary or in pairs; bracteoles about ½ in. long, narrow, tubulate; pedicels glifiform nodding. *Calyx* ½ in. long, divided about ½-way down; lobes triangular, acute. *Corolla* blue, tube about as long as the calyx; upper lip about  $\frac{1}{4}$  in. long, with 2 triangular acute lobes, lower lip nearly twice as long as the upper and with 3 shallow obtuse lobes. *Capsule* ½ in. long.

Dehra Dun, flowering during the rainy season. *DISTRIB.* Himalaya from Kumaon to Bhutan up to 5000 ft., China Szechuan and C. India to W. and S. India, also in Ceylon. The type occurs in Tenasserim the Malay Islands and in China.

### LXXXIII.—BIGNONIACEÆ.

Trees, shrubs (rarely climbing) or herbs. *Leaves* opposite, rarely alternate, unequally 1-3-pinnate, or sometimes undivided. *Flowers* hermaphrodite, irregular, usually showy, arranged in terminal racemes or panicles, rarely on short lateral branches; bracts and bracteoles inconspicuous. *Calyx* spathaceous or funnel-shaped; lobes 2-5 or more, valvate. *Corolla* 2-lipped, tubular-ventricose; lobes 5, subequal, imbricate in bud. *Stamens* didynamous, rudiment of 5th stamen often present and inserted where the corolla-tube is suddenly swollen, rarely with five perfect stamens; filaments glabrous or hairy at the base; anthers 2-celled, included or rarely shortly exerted; cells elliptic or oblong, parallel or diverging, dehiscing by longitudinal slits. *Disk* usually thick or annular. *Ovary* subsessile, 2-celled; style long, glabrous, stigma of 2 elliptic lobes; ovules

usually in many rows, anatropous. *Fruit* a loculicidally or septicidally 2-valved capsule, usually elongated; septum enlarging in fruit, deciduous with the placentas. *Seeds* compressed, discoid, rarely subtrigonal, usually prominently winged, exalbuminous.—Species about 550, mostly tropical and chiefly in S. America; a few are extratropical, including two Himalayan herbaceous species of *Amphiceum*.

Perfect stamens 5 . . . . .	1. OROXYLUM.
Perfect stamens 4:—	
Leaves simple . . . . .	2. TECOMELLA.
Leaves pinnate:—	
Calyx spatulate . . . . .	3. DOLICHANDRONE.
Calyx campanulate . . . . .	4. STEREOSPERMUM.

### 1. OROXYLUM Vent. ; Fl. Brit. Ind. iv, 377.

A glabrous tree. *Leaves* opposite, large, 2-3-pinnate; leaflets ovate, entire. *Flowers* in long terminal racemes. *Calyx* large, campanulate, coriaceous, truncate or obscurely toothed, persistent. *Corolla* large, campanulate, white or purplish; lobes 5, subequal, round, crisped and toothed. *Stamens* 5, perfect, exserted, four of them equal, the fifth shorter; filaments straight; anthers glabrous, 2-celled; cells oblong, parallel. *Disk* wide. *Fruit* a large linear 2-valved capsule, compressed parallel to the septum, opening septifragally. *Seeds* many, thinly discoid; wing broad, hyaline.—A single species, found in India, Ceylon, Burma, Malaya, China and Cochin-China.

*O. indicum*, Vent. Dec. Gen. Nov. 8; F. B. I. iv, 378; Watt E. D.; Kanjilal For. Fl. 254; Gamble Man. Ind. Timb. 510; Collett Fl. Siml. 368, Prain Beng. Pl. 787; Cooke Fl. Bomb. ii, 327; Brandis Ind. Trees 496. *Bignonia indica*, Linn.; Roxb. Fl. Ind. iii, 110; Royle Ill. 295. *Calosanthos indica*, Blume; Brandis For. Fl. 347. Vern. Ullu, arlu, pharkath, pharri, sanna (Oudh).

A small deciduous soft-wooded tree, up to 40 ft. high, branching near the top; bark light-brown, usually covered with corky lenticels. *Leaves* very large, sometimes attaining 5 ft. in length; rachis stout, cylindric; leaflets 2-4 pairs, 2½-5 in. long, ovate or elliptic, acuminate, entire, glabrous, base rounded or cordate, petiolules ¼-½ in. long. *Flowers* many, in large erect racemes 1-2 ft. long or more, foetid, pedicels ½-1¼ in. long. *Calyx* about 1 in. long, oblong-campanulate, obscurely toothed, coriaceous, glabrous. *Corolla* 2-3 in. long, fleshy, tube green, limb lurid-purple, margins crisped. *Filaments* woolly at the base. *Capsule* 1-3 ft. by 2-3½ in. wide, flat and straight. *Seeds* many, 2-3 in. long, margins broadly winged except at the base.

Sub-Himalayan tracts from the Jumna eastwards, usually in more or less moist places. Flowers during June and July, and the fruit ripens in the cold season. **DISTRIB.** Throughout India except in the western dry area. Himalaya ascending to 4,000 ft. in Kumaon; also in Ceylon and Burma, extending to the Malay Penins. and Archipel, and Cochin-China. The bark and fruit are used as a mordant in dyeing and tanning, and the root-bark is much valued as a native medicine, the extremely light seeds are made use of for lining hats.

## 2. *TECOMELLA*, Seem.; Fl. Brit. Ind. iv, 378.

A shrub or small tree with glaucescent foliage; innovations stellately grey-tomentose, otherwise quite glabrous. *Leaves* usually opposite, simple, oblong, obtuse, entire. *Flowers* in terminal racemes. *Calyx* tubular-campanulate, subequally 5-toothed. *Corolla* tubular-ventricose, mouth wide; lobes subequal, rounded, imbricate. *Stamens* exserted; anther-cells divergent, pendulous. *Disk* cupular. *Ovary* oblong, ovules many in each cell. *Capsule* linear-oblong, somewhat compressed, opening loculicidally. *Seeds* discoid, winged, the wing very narrow at its apex, absent at the base.—A single species found in India, Baluchistan and Arabia.

*T. undulata*, Seem. in *Ann. & Mag. Nat. Hist. Ser. 3, Vol. X, 30*; *Cooke Fl. Bomb. ii, 328*. *Tecoma undulata*, G. Don; *F. B. I. iv, 378*; *Watt E. D.*; *Brandis For. Fl. 352*; *Ind. Trees 492*; *Gamble Man. Ind. Timb. 511*. *Bignonia undulata*, Smith; *Roxb. Fl. Ind. iii, 101*; *Royle Ill. 295*. *B. glauca*, DCne, in *Jacquem. Voy. Bot. 137, t. 142*. Vern, Roira, rohera (Merwara).

Branches drooping. *Leaves* 2-5 in. long, narrowly oblong, margins undulate, petiole 1 in. long. *Flowers* inodorous, in corymbose racemes terminating short lateral branches, pedicels  $\frac{1}{2}$  in. long. *Calyx* nearly  $\frac{1}{2}$  in. long; lobes hardly  $\frac{1}{4}$  in. long, broadly ovate, obtuse, mucronate. *Corolla*  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, orange-yellow, veined. *Filaments* glabrous. *Stigma* of 2 spatulate-oblong plates. *Capsule* about 8 in. long, slightly curved, glabrous, valves thin. *Seeds* (including wing) 1 in. by  $\frac{3}{4}$  in.

Jumna and Chambal ravines near Etawah, also in Merwara. *Flowers* Jan.-April. **DISTRIB.** Punjab, on the Siwalik range west of Jumna, Rajputana, Sind and Gujarat, extending to Baluchistan and Arabia. Very ornamental when in flower. Wood grey or yellowish-brown mottled with lighter streaks, strong and durable. The leaves afford good fodder and the bark is used medicinally.

## 3. *DOLICHANDRONE*, Seem.; Fl. Brit. Ind. iv, 378.

Trees, glabrous or tomentose. *Leaves* opposite, 1-pinnat. *Flowers* in terminal racemes or panicles. *Calyx* spathaceous, cleft to the base on one side. *Corolla* tubular, tube long or short; lobes

5, subequal, round, crisped, crenate or incised. *Anther-cells* oblong, parallel. *Disk* annular, cushion-like. *Ovary* sessile, ovules usually many-seriate. *Fruit* a long subterete or compressed capsule, loculicidally 2-valved, imperfectly 4-celled. *Seeds* thinly discoid, with a broad wing on each side.—Species about 20, in India and Ceylon, extending to Malaya, China, Trop. Africa and Austialia.

*D. falcata*, Seem. in Journ. Bot. viii, 381; F. B. I. iv, 380; Wall. E. D.; Gamble Man. Ind. Timb. 512; Cooke Fl. Bomb. ii, 329; Brand. Ind. Trees 493. *D. Lawii*, Seem.; F. B. I. iv, 380. *Spathodea falcata*, Wall.; Brandis For. Fl. 350. *Bignonia spathacea*, Roxb.; Fl. Ind. iii, 103.

A deciduous tree up to 50 ft. high; innovations grey-pubescent or shortly villous. *Leaves* simply pinnate, 3-6 in. long; leaflets 5-7, pubescent or glabrous,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, obovate or suborbicular, rarely with a small obtuse point, more or less unequal at the base, the terminal usually larger; main lateral nerves about 4 pairs, prominent beneath, petioles short or none. *Racemes* terminal, few-fl., pedicels  $\frac{1}{2}$  in. long. *Calyx*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, softly grey-pubescent. *Corolla* white, about 1 in. long; tube 1 $\frac{1}{2}$  in. long, slender, tapering downwards; lobes obovate-oblong, their margins undulate and crisped. *Capsule* 10-18 in. long and about  $\frac{1}{2}$  in. wide falcately curved, compressed, glabrous. *Seeds* about 1 in. long by  $\frac{1}{4}$  in. wide, rectangular, winged at both ends.

Bundelkhand, on hills above Doni (Duthie), dry hills in C. India (Edgeworth). Flowers in May and June. DISTRIB. Rajputana, W. and S. India. The hard whitish wood is used for building and agricultural purposes. A decoction of the fruit is said to be used in native medicine.

#### 4. S EREOSPERMUM, Cham.; Fl. Brit. Ind. iv, 382.

Trees. *Leaves* large, 1-or 2-pinnate. *Flowers* in large lax terminal panicles. *Calyx* ovoid, closed or open in bud, truncate or shortly and unequally 2-5-lobed or 5-toothed in flower. *Corolla* tubular-campanulate; limb spreading, 5-lobed and somewhat 2-lipped; lobes subequal, round, often crisped toothed or laciniate. *Stamens* 4, with a rudimentary 5th; anther-cells linear, diverging. *Disk* cushion-like, fleshy. *Fruit* an elongate terete subcompressed or obscurely 4-angled capsule, loculicidally 2-valved and often spirally twisted, septum at length thick and corky. *Seeds* many, in one or two series, trigonous, with a transverse groove outside and a prominent ridge within which fits into a deep groove of the septum; wings membranous, lying flat on the septum.—Species 12, in Tropical Asia and Africa.

Panicle-branches slender, glabrous; capsule subquadragular, smooth

1. *S. chelonoides*.

Panicle-branches short, viscidly hairy;

capsule cylindric, rough

2. *S. suaveolens*.



1. *S. chelonoides*, DC. *Prod. ix*, 210; Brandis *For. Fl.* 352; *Ind. Trees* 495; F. B. I. iv, 382; Watt E. D.; Gamble *Man. Ind. Timb.* 514; Prain *Beng. Pl.* 790; Cooke *Fl. Bomb.* ii, 331. *Bignonia chelonoides*, Linn. f.; Roxb. *Fl. Ind.* iii, 106. Vern. Pader, parral.

A deciduous tree, 30-60 ft. high, glabrous except the flowers; bark thick, brown, corky outside, branches spreading. Leaves simply pinnate, 12-18 in. long; leaflets 3-5 pairs and an odd one, 4-5 in. long by 1-2 in. wide, elliptic, caudate-acuminate, glabrous; base acute or rounded, often unequal-sided, petiolules  $\frac{1}{2}$  in. or less. Flowers fragrant, in lax drooping panicles with slender articulate glabrous branches. Calyx campanulate,  $\frac{1}{4}$  in. long, glabrous, usually purple, shortly 3-5-lobed. Corolla  $\frac{3}{4}$  in. long, yellow, veined and tinged with purple, more or less pubescent outside, bearded within on the lower side; lobes of limb rounded and crisped. Filaments villous at the base. Capsule 1-2 ft. long by  $\frac{1}{2}$  in. wide, subquadrangular and pointed, spirally twisted, often dotted with white specks. Seeds 1-1 $\frac{1}{4}$  in. long, splitting easily along the transverse furrow.

Forests of N. Oudh. Flowers April to June, after the leaves have appeared. DISTRIB. Eastwards to Sikkim Chittagong and Chota Nagpur; also in the moist forests of Bombay, S. India and Ceylon, extending to Burma. The hard grey wood is used for building and for making furniture. The roots, leaves and flowers are employed in native medicine.

2. *S. suaveolens*, DC. *Prod. ix*, 211; Brandis *For. Fl.* 351; *Ind. Trees* 495; F. B. I. iv, 382; Watt E. D.; Kanjilal *For. Fl. Sch. Circ.* 255; Gamble *Man. Ind. Timb.* 515; Prain *Beng. Pl.* 790; Cooke *Fl. Bomb.* ii, 331. *Bignonia suaveolens*, Roxb. *Fl. Ind.* iii, 104; Royle *Ill.* 295. Vern. Pâdal.

A deciduous tree up to 60 ft. high, young parts viscous-hairy. Bark grey exfoliating in large thick flat scales. Leaves 1-2 ft. long, simply pinnate; leaflets 3-4 pairs with an odd one, shortly stalked, 3-6 in. long, broadly elliptic, acute or acuminate, entire or serrulate, rough above, hairy beneath, rounded and unequal at the base, main lateral nerves 6-8 pairs, petiolules about  $\frac{1}{10}$  in. long. Flowers very fragrant, arranged in large lax 3-chotomously branched viscidly hairy panicles. Calyx  $\frac{3}{4}$  in. long, shortly 3-5-lobed. Corolla dull-purple, funnel-shaped, 1-1 $\frac{1}{2}$  in. long, puberulous outside, bearded within at the throat; limb oblique, 2-lipped; lobes rounded, crenate and crisped, the 3 lower longer than the 2 upper. Filaments not villous at the base. Capsule 1-2 ft. long by  $\frac{3}{4}$  in. wide, straight, cylindric, somewhat ribbed, grey or purplish, rough with white raised specks. Seeds 1 $\frac{1}{4}$  in. long, with a long membranous wing at each end.

Common within the *sâl* areas of the Dehra Dun and Saharanpur forests and in the Sub-Himalayan tracts eastwards. Flowers during May and June, and the fruit ripens in the cold season. DISTRIB. Punjab Plain, becoming scarce west of the Jhelum; outer Himalayan ranges from

Kashmir to Sikkim, up to 4,000 ft.; found also in the drier parts of Bengal, and in Central W. and S. India, extending to Burma. The wood is valued for planks and beams; it polishes well, and is much used as fuel and for making charcoal. The bark and flowers are said to be employed medicinally. Regarding the sylvicultural value of this tree see Gamble l.c.

This family is remarkable for the large number of handsome-flowered trees and shrubs which it contains. The following, belonging to genera not indigenous in India are some of the more important species cultivated within the area of the upper Gangetic Plain:—

**MILLINGTONIA HORTENSIS**, Linn. f.; Brandis For. Fl. 347; Ind. Tree 496; F. B. I. iv, 377; Watt E. D.; Kanjilal For. Fl. 256; Gamble Man. Ind. Timb. 509; Prain Beng. Pl. 788; Cooke Fl. Bomb. ii, 334. *Bignonia suberosa*, Roxb; Fl. Ind. iii, 111.—Vern. *Akás-nim*, *chambeli*. (Indian Cork tree).—A tall erect fast-growing tree with corky bark and soft yellowish wood. Leaves bi- or tripinnate, 2-3 ft. long. Flowers white, very fragrant, arranged in large panicles which are terminal on the pendent branches. This tree, supposed to be indigenous in Burma and the Malay Archipelago, is cultivated in gardens and as a roadside tree within the area of this flora and in many other parts of India. As an avenue-tree it cannot be altogether recommended; for, owing to the brittleness of its branches, it is liable to be much damaged during severe storms. It flowers at the beginning of the cold season, but produces no seed in this part of India.

**PANDOREA JASMINOIDEA**, K. Schum.; Cooke Fl. Bomb. ii, 335. *Tecoma jasminoides*, Lindl.—A climbing shrub with pale bluish flowers. It is a native of Australia and is frequently cultivated in the gardens of Upper India.

**PYROSTEGIA IGNEA** Presl.; Cooke Fl. Bomb. ii, 335. *Bignonia venusta*, Ker. Gawl.—A large climbing shrub with 3-foliolate leaves and large handsome orange-red flowers arranged in terminal racemes. A native of Brazil.

**CAMPsis RADICANS**, Seem.; Cooke Fl. Bomb. ii, 335. *Tecoma radicans*, Lindl.—A scandent shrub climbing like ivy, and with red flowers. Indigenous in N. America.

**STENOLOBIUM STANS**, Seem.; Cooke Fl. Bomb. ii, 335. *Tecoma stans*, Juss.; Gamble Man. Ind. Timb. 511; Prain Beng. Pl. 788.—A hardy shrub or small tree with handsome foliage and large yellow flowers. It is a native of S. America, and in some parts of India has become almost naturalized.

**HETEROPHRAGMA ADENOPHYLLUM**, Seem.; F. B. I. iv, 381; Watt E. D.; Gamble Man. Ind. Timb. 514; Brand. Ind. Trees 494; Prain Beng. Pl. 789; Cooke Fl. Bomb. ii, 336.—A handsome tree with large pinnate leaves. Flowers brownish-yellow, densely tomentose. Capsule 1-3 ft. long, twisted. A native of E. Bengal, Burma and the Andaman Islands. Often planted in the gardens of Upper India. The wood is valued for cabinet work.

**KIGELIA PINNATA**, DC. ; *Gamble Man. Ind. Timb.* 517 ; *Cooke Fl. Bomb.* ii, 386 ; *Brandis Ind. Trees* 492.—An ornamental tree introduced from Trop. Africa, and now largely grown in Indian gardens. The rough pinnate leaves are clustered towards the ends of the branches, and the large handsome maroon-coloured flowers are arranged on long pendent racemes and open during the hot season. The hard gourd-like fruits, 2-3 ft. long, ripen during the cold season. It is a quick-growing tree and the wood is hard.

#### LXXXIV.—PEDALIACEÆ.

Herbs, rarely undershrubs. *Leaves* opposite or the upper alternate, entire toothed or lobed. *Flowers* irregular, hermaphrodite, usually axillary and solitary (rarely fascicled or in racemes), pedicels short bracts none or minute. *Calyx* 4 5-partite. *Corolla* tubular-ventricose ; limb obscurely 2-lipped ; lobes 5, imbricate. *Stamens* didynamous, rarely 2. *Ovary* 2-celled, rarely 1-celled, style filiform, stigma shortly 2-lobed ; ovules many or few, superposed. *Fruit* hard and indehiscent, or a 2-(rarely 3-4) valved capsule. *Seeds* (in the Indian species) wingless, albumen none.—Species about 45, in the warmer parts of both hemispheres, especially in desert regions and on sea-coasts.

**SESAMUM**, Linn. ; *Fl. Brit. Ind.* iv, 386.

Erect to prostrate herbs. *Leaves* opposite below, upper alternate, entire toothed, lobed or divided. *Flowers* axillary, solitary or few and fascicled, shortly pedicelled, purplish or pink, often marked with yellow. *Calyx* small, 5-partite. *Corolla* tubular-ventricose, base subgibbous ; limb 2-lipped ; lobes 5, those of the upper lip usually smaller. *Stamens* didynamous, included ; anthers sagittate, the cells subparallel, distinct. *Ovary* 2-celled, becoming 4-celled by the intrusion of a false, dissepiment ; ovules many, 1-seriate in each chamber ; style filiform, stigma 2-lobed. *Capsule* oblong or ovoid, loculicidally 2-valved, 4-chambered, usually 4-angled. *Seeds* many, obliquely oblong, subcompressed, foveolate.—Species about 10, in India and in Trop. and S. Africa.

**S. indicum**, Linn. *Sp. Pl.* 634 ; DC. *L'Orig. Pl. Cult.* 337 ; *Duthie and Fuller Field and Gard. Crops* ii, 35, t. 42 ; *F. B. I.* iv, 387 ; *Watt E. D.* ; *Comm. Prod. Ind.* 981 ; *Prain Beng. Pl.* 792 ; *Cooke Fl. Bomb.* ii, 338. *S. orientale*, Linn. ; *Roxb. Fl. Ind.* iii, 100.—Vern. *Til*, *tili*, *tila* (Sansc.) Gingelly or Sesame.

An erect pubescent or puberulous annual, 1-2 ft. high, branching from the base. *Leaves* oblong or ovate, 3-5 in. long, the lower ones lobed or often pedatisect, lobes serrate ; upper leaves narrowly oblong, entire, glabrous above, puberulous beneath. *Pedicels*  $\frac{1}{2}$  in. long, solitary or

2-3-nate. *Flowers* with a strong unpleasant odour. *Calyx-segments*  $\frac{1}{2}$  in. long, lanceolate, acute, hairy. *Corolla*  $1\frac{1}{2}$  in. long, hairy outside, pinkish-purple and often marked with yellow. *Capsule* about 1 in. long, erect, hispid, beak short, valves separating half-way down. *Seeds* black or white, glabrous.

Extensively cultivated within the area during the rainy season, but chiefly as a mixed crop. Sometimes met with as a naturalized weed. In other parts of India it is usually grown as a pure crop. There are two well-marked varieties, black-seeded and white-seeded; the former yields the best oil and is therefore more abundantly grown. The oil is largely used in India for culinary purposes, as well as for burning in lamps, and it is also employed in anointing the body and in the manufacture of soap and perfumes. The seeds of the white-seeded variety are often eaten, chiefly in the form of sweetmeats. The oil and seeds are very largely exported to Europe, for particulars of which trade see Watt's "Commercial Products of India," p. 987. There is considerable doubt as to the native country of this plant. Decandolle regarded it as having come originally from the Malay Archipelago, whilst other authors consider it be of Indian or of African origin.

*MARTYNIA DIANDRA* *Gloss.*; *F. B. I.* iv, 386; *Watt E. D.*; *Prain Beng Pl.* 791; *Cooke Fl. Bomb.* ii, 339.—*Vern. Bichu.* (Tiger-claw or Devil's claw). A tall coarse herb. *Leaves* large, opposite, cordate, glutinous. *Flowers* diandrous, rose-coloured. *Fruit* large, woody, beaked by two strong curved spines. Common within the area and in other parts of India on roadsides and in waste places, flowering during the rainy season. The plant is a native of Mexico

### LXXXV.—ACANTHACEÆ.

Herbs or shrubs, rarely trees. *Leaves* opposite, usually entire, exstipulate. *Flowers* nearly always irregular, in cymes racemes or spikes, rarely solitary; bracts large or small or none; bracteoles usually 2, sometimes more and forming an epicalyx. *Calyx* 5- or 4-partite or (in *Thunbergia*) minute and multifid. *Corolla* 2-lipped or subequally 5-lobed, lobes imbricate or twisted in bud. *Stamens* 4 or 2, inserted on the corolla-tube; anthers 2- or 1-celled, the cells sometimes remote. *Disk* often conspicuous. *Ovary* superior, 2-celled; style simple, filiform or swollen below; stigma usually 2-lobed, the lobes often unequal; ovules 1 or more in each cell, in one or two series, anatropous. *Fruit* a loculicidal capsule, the valves often elastically recurved and the septum splitting. *Seeds* usually hard, attached (except in a few genera) to recurved subacute supports (retinacula), ovoid or compressed, smooth rugose or rarely hispid, usually exalbuminous.—Species upwards of 2,000, in tropical and warm temperate regions.

- Climbers; seeds not supported on hard retinaculum; ovules 2 in each cell, collateral . . . 1. *TRUNBERGIA*.
- Erect or prostrate plants, not climbing:—  
 Seeds not supported on retinaculum; ovules many, superposed in 2 rows in each cell:—  
 Calyx 4-partite, stamens 2.  
 Bracts rigid, peduncle of spike covered with alternate scales . . . 2. *TUBIFLORA*.  
 Bracts herbaceous, spike sessile, or if stalked the peduncle without scales . . . 3. *NELSONIA*.  
 Calyx 5-partite, stamens 4 . . . 4. *STAUROGYNE*.
- Seeds supported on retinacula:—  
 Upper lip of corolla subobsolete; lower lip large, expanded, 3-lobed; ovules 2 in each cell . . . 5. *BLEPHARIS*.  
 Corolla 2-lipped or with 5 subequal lobes:—  
 Corolla lobes twisted to the left in bud:—  
 Ovules more than 2 in each cell, capsule normally 6- or more-seeded:—  
 Corolla distinctly 2-lipped:—  
 Inflorescence spinose . . . 6. *ASTERACANTHA*.  
 Inflorescence not spinose . . . 7. *HYGROPHILA*.  
 Corolla subequally 5-lobed:—  
 Bracteoles large; capsule clavate, with a solid base . . . 8. *RUELLIA*.  
 Bracteoles small, narrow or none, capsule seed-bearing throughout:—  
 Flowers in sessile clusters which are arranged on the branches of a trichotomous or 1-sided panicle . . . 9. *ÆCHMANTHERA*.  
 Flowers sessile, in terminal or pseudo-axillary heads or spikes . . . 10. *HEMIGRAPHIS*.  
 Ovules 2 in each cell, capsule with 4 or fewer seeds:—  
 Placentas separating elastically from the base of the capsule; stamens 4; bracteoles very large . . . 11. *PETALIDIUM*.  
 Placentas remaining attached to the base of the ripe capsule:—  
 Anthers minutely mucronate or spurred at the base; stamens four . . . 12. *DISCHORISTE*.  
 Anthers blunt at the base:—  
 Cor-tube slender, linear; stamens two . . . 13. *DÆDALACANTHUS*.  
 Cor-tube widened from near the base; stamens four . . . 14. *STROBILANTHES*.

Cor-lobes imbricate in bud :—

Ovules 3-8 in each cell, capsule normally 6—or more-seeded :—

Capsule compressed at right angles to the septum; seeds ovoid, hardly compressed :—

Flowers in panicled often 1-lateral racemes, without axillary barren branches (cladodes) . . . . . 15. ANDROGRAPHIS.

Flowers in spikes in the midst of cladodes . . . . . 16. HAPLANTHUS.

Capsule subterete, seeds much compressed . . . . . 17. PROLOGACANTHUS.

Ovules 2 or rarely 1 in each cell :—

Corolla-lobes 5, subequal :—

Calyx 4-part., the two opposite outer segments much longer than the inner; perfect stamens 2 . . . . . 18. BARLERIA.

Calyx 5-part., segments subequal; stamens 4, all perfect . . . . . 19. ASYSTASIA.

Corolla distinctly 2-lipped :—

Stamens 4 . . . . . 20. LEPIDAGATHIS.

Stamens 2 :—

Placentas remaining attached to the valves of the capsule :—

Anther-cells parallel, subequal; bracts large, imbricate; cor-tube long, narrow . . . . . 21. ECBOLIUM.

Anther-cells placed one higher up than the other :—

Anther-cells (at least the lower) with a white basal spur-like appendage (apiculate in *J. Adhatoda*) . . . . . 22. JUSTICIA.

Anther-cells mucicous . . . . . 23. PERISTROPHE.

Placentas separating elastically from the base of the capsule :—

Flowers in 1-lateral spikes . . . . . 24. RUNGIA.

Flowers crowded in axillary cymes towards the end of the branches . . . . . 25. DICHLIPTEA.

# 1. THUNBERGIA, Linn. f.; Fl. Brit. Ind. iv, 390.

Climbers. *Leaves* opposite, often cordate hastate or angular. *Flowers* axillary, solitary or in pairs or racemose, bracts at the base of the pedicels leaf-like; bracteoles large, the margins cohering, at

least when young. *Calyx* small, annular, teeth 10-16 or obscure. *Corolla* conspicuous; tube swollen, curved; limb oblique, with rounded lobes, twisted to the left in bud. *Stamens* didynamous, attached to the base of the corolla-tube; anthers 2-celled; cells parallel, oblique, spurred or not at the base; pollen globose, obscurely banded. *Disk* annular or cushion-like. *Ovary* with 2 collateral ovules in each cell, style long, stigma funnel-shaped, 2-lobed or entire, or style 2-fid and with capitate stigmas. *Fruit* a capsule, globose below, suddenly narrowed to a barren sword-shaped beak. *Seeds* 2 in each cell, ovoid or dorsally compressed, the glabrous base plane or hollowed, funicle minute or conic.—Species about 90, in tropical regions of the Old World.

*T. fragrans*, Roxb. *Cer. Pl.* i, 47, t. 67; *Fl. Ind.* iii, 33; *F. B. I.* iv, 393; *Prair Beng. Pl.* 795; *Cooke Fl. Bomb.* 342.

Stem long and slender with swollen nodes, retroscely hairy or glabrous. *Leaves* 2-3 in. long, oblong or deltoid-ovate, acute or obtuse rounded cordate or hastate at the base, entire or with a few basal angular apiculate lobes, petioles  $\frac{1}{2}$  in. long. *Flowers* solitary or in pairs in the axils, pedicels 1-2 in. long; bracteoles  $\frac{1}{2}$  in., broadly falcate-oblong, subacute. *Calyx*  $\frac{1}{2}$  in., pubescent, deeply divided into 12-15 linear-lanceolate acute segments, nearly glabrous in fruit. *Corolla* inodorous, pure white,  $1\frac{1}{2}$  in. long, pubescent outside; tube about as long as the segments, constricted below the limb; segments 5, spreading, obovate, truncate, coarsely toothed. *Anthers* not spurred. *Capsule* (including beak) about 1 in. long, grey-puberulous. *Seeds* 4 or less,  $\frac{1}{8}$  in. in diam., hemispheric, excavated on the plane face, rugose.

Probably indigenous in the Sub-Himalayan tracts from the Jammu eastwards. Cultivated in gardens. Flowers in Oct. and Nov. **DISTRIB.** Throughout India chiefly in the hilly districts; also in Ceylon, Burma, and the Malay Peninsula, extending to Timor, the Philippines and N. Australia. The specimens from N. India are referred to *T. fragrans*, var. *lævis* F. B. I. l. c., which differs from the type in having 2 pedicels in each axil, and it is also a much less hairy plant. The specific name applies to the plant as a whole, and not to the flowers which are inodorous.

**THUNBERGIA ALATA**, Boj.; *F. B. I.* iv, 391; *Prair Beng. Pl.* 795; *Cooke Fl. Bomb.* ii, 343.—A slender climber. *Leaves* softly villous, ovate, cordate, subentire; petioles usually winged. *Flowers* yellow or whitish, with a brown or claret-coloured eye. Much cultivated in gardens, and becoming naturalized as an escape in many parts of the area. It is a native of Trop. Africa and Natal.

**THUNBERGIA GRANDIFLORA**, Roxb.; *Fl. Ind.* iii, 34; *F. B. I.* iv, 392; *Gamble Man. Ind. Timb.* 518; *Prair Beng. Pl.* 796. *Cooke Fl. Bomb.* ii, 343; *Brandis Ind. Trees* 497.—An extensive climber with large cordate-

ovate or sometimes angular leaves and blue flowers. Often cultivated in gardens, and sometimes met with in a semi-wild state within the area. It is a native of E. Bengal whence it extends to S. China.

## 2. TUBIFLORA, J. F. Gmel.

UNDER ELYTRARIA IN FL. BRIT. IND. IV, 394.

Herbs, stemless or nearly so. *Leaves* alternate, crowded, sub-radical. *Flowers* in close rigid simple or divided spikes. *Scapes* covered by spirally imbricate bracts; bracteoles smaller than the bracts. *Calyx* 4-partite; segments unequal, the largest sometimes 2-fid. *Corolla* white or bluish, 2-lipped, tube linear; lobes 5, oblong, imbricate in bud. *Stamens* 2, perfect, attached to the throat of the corolla; anthers elliptic, acute; cells parallel, with or without a minute spur at the base. *Disk* small. *Style* short, stigma shortly 2-lobed; ovules 6-10 in each cell, superposed. *Fruit* an ellipsoid acute capsule. *Seeds* minute, ovoid, reticulated, minutely papillose, attached by a small hilum, without a retinaculum.—Species 3 or 4, American, one of which is widely spread in Trop. Africa and Asia.

*T. acaulis*, O. Kuntze *Revis. Gen. i*, 500; Cooke *Fl. Bomb. ii*, 345. *Elytraria crenata*, Vahl; Royle *Ill.* 298; F. B. *I. iv*, 394. *Justicia acaulis*, Linn. f.; Roxb.; *Fl. Ind. i*, 119.

*Stem* none or up to 2 in. long, woolly. *Leaves* 3-8 in. long, obovate or oblanceolate, obtuse or apiculate, tapering into a hairy petiole, more or less crenate, nerves beneath pubescent. *Scapes* several, usually longer than the leaves, clothed with small rigid elliptic acuminate bract-like scales. *Spikes* hard,  $\frac{1}{2}$ -4 in. long, simple or branched; bracts  $\frac{1}{2}$  in. long, ovate, acuminate or spine tipped, hairy outside and with ciliate margins. *Calyx*  $\frac{1}{2}$  in. long; segments pennicillate at the apex and with scarious ciliate margins, three of them narrowly lanceolate, the 4th broader and sometimes 2-fid. *Corolla*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, pale-blue or white. *Anthers* without a basal spur. *Capsule*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long.

Moradabad (T. Thomson), ravine-tracts in the vicinity of Delhi and Agia (Royle, Munro), Bundelkhand (Edgeworth, Duthie), Merwara (Duthie). Flowers after the rainy season. **DISTRIB.** Southwards through the drier parts of Peninsular India and in Ceylon, extending to Trop. and S. Africa and to Trop. and N. America.

## 3. NELSONIA, R. Br.; Fl. Brit. Ind. iv, 394.

A diffuse softly villous herb. *Leaves* opposite, subequal. *Flowers* in ovate or cylindric spikes; bracts herbaceous, ovate, glandular-villous, closely imbricate, alternate or spirally scattered, bracteoles



none. *Calyx* small, 4-partite; segments unequal, lanceolate, the larger often bifid. *Corolla* very small, purplish-rose or white, tube slender, limb 2-lipped; lobes 5, obtuse, spreading. *Stamens* 2, attached above the middle of the corolla-tube; anthers 2-celled, subincluded; cells elliptic, distinct, more or less divergent, glabrous or ciliate, mucous or minutely spurred. *Ovary* with 8-10 ovules in each cell, stigma shortly 2-lobed. *Fruit* an ovoid pointed capsule, bearing the seeds below the middle. *Seeds* small, ellipsoid or sub-globose, smooth, not supported on retinacula.—A single species, occurring in S. E. Asia, Africa, and Australia; also in America where it has probably been introduced.

*N. campestris*, R. Br. Prod. 481; F. B. I. iv, 394; *Prain Beng. Pl.* 707; *Cook Fl. Bomb.* ii, 345. *Justicia lamifolia*, Koen.; *Reich. Fl. Ind.* i, 134.

*Stems* short, branches trailing. Young parts more or less densely clothed with white hairs. *Leaves* elliptic-oblong, entire, the lower 4-8 in. long and with long petioles; upper subsessile,  $\frac{1}{2}$ -2 in. clothed with grey woolly pubescence. *Flowering spikes*  $\frac{1}{2}$ -2 in. long, ovate or cylindric; bracts herbaceous,  $\frac{1}{2}$ -1 in. long, ovate, subobuse, softly pubescent, bracteoles represented by 2 opposite tufts of hairs situated below the calyx. *Calyx*  $\frac{1}{2}$  in. long, strongly nerved. *Corolla*  $\frac{1}{2}$  in. long, purplish. *Capsule* ovoid-conic, 8-12-seeded, glabrous. *Seeds* broadly ellipsoid, yellowish with brown granulations.

Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur; also in Bundelkhand. *DISTRIB.* Throughout India, except in the desert tracts, up to 4 000 ft. on the Himalaya and in Ceylon; extending to S. E. Asia, Australia, Africa and America.

#### 4. STAUROGYNE, Wall.

UNDER EBERMAIERA IN FL. BRIT. IND. IV, 335.

Herbs or small undershrubs. *Leaves* opposite, rarely alternate. *Flowers* in terminal or pseudo-axillary simple or compound dense or lax racemes or spikes, bracts usually leaf-like; bracteoles 2, near the base of the calyx, smaller than the bracts. *Calyx*, deeply 5-partite; segments oblong or linear, subequal or one larger than the others. *Corolla* 2-lipped, tube long or short, cylindric or somewhat funnel-shaped; lobes 5, short, spreading. *Stamens* didynamous, usually included, filaments usually hairy; anthers with 2 ovoid mucous distant cells. *Disk* inconspicuous. *Style* linear, glabrous, with 2 lobes, the lower one often again 2-lobed; ovules numerous.

*Fruit* a small oblong capsule, seed-bearing throughout. *Seeds* 15-30 in each cell, small, globose or cuboid, glandular or nearly smooth when mature, reticula none, hilum hollowed.—Species about 40, in S. E. Asia, Malaya, Australia and Brazil.

*S. glutinosa*, O. Kuntze Rev. Gen. i, 497; *Ebermaiera glutinosa*, Wall.; *F. B. I.* iv, 396; *Prair. Beng. Pl.* 798. *E. glauca*, T. Anders. in Journ. Linn. Soc. ix, 450 (not of Nees).

*Stems* many, 12-18 in long, trailing, pubescent. *Leaves* all opposite, shortly stalked, about 1½ in. long, elliptic, subobtusate, entire, tapering to the base, minutely pubescent or glabrous. *Heads* pseudo-axillary, on short branches, 2-8-fl., subglobose; bracts ½ in. long, narrowly obovate-oblong, viscid. *Calyx-segments* viscidly pubescent, one slightly longer than the others. *Corolla* ½ in. long, bluish with dark veins, pubescent outside. *Stigma* with one lobe oblong, the other bifid.

Abundant within the area, often met with in rice-fields and on swampy ground. *DISTRIB.* Punjab Plain, Rajputana, and C. India to N. and C. Bengal, also in Sylhet.

### 5. BLEPHARIS, Juss.; Fl. Brit. Ind. iv, 478.

Herbs or undershrubs, often rigid or prickly. *Leaves* opposite or 4 in a whorl, subentire or toothed and sometimes prickly. *Spikes* terminal or on suppressed lateral branches, strobilate, 4-ranked or capitate and few or 1-flowered; lower bracteoles leaf-like, upper linear. *Calyx* deeply 4-partite; segments unequal, in opposite pairs, one of the larger pair emarginate or 2-lobed, the 2 inner segments much shorter and narrower. *Corolla* 2-lipped, tube rigid, upper lip subobsolete; lower spreading, 3-lobed, purple blue or white. *Stamens* didynamous; filaments thick, rigid, connective of the lower stamens produced; anthers with one large cell densely bearded on the margin, the other cell small and obsolete. *Disk* annular, inconspicuous. *Ovary* glabrous, with 2 ovules in each cell, style linear, stigma shortly 2-fl. *Fruit* an oblong or ellipsoid capsule, 2- or 4-seeded. *Seeds* compressed, suborbicular, echinate or ciliate.—Species about 50, mostly African, 5 in India.

Flowers in short heads, solitary or 2 or 3 together.—Herbs :—

Leaves petioled, up to 2½ in. long, thin acute . . . 1. *B. boerhaviaefolia*.

Leaves sessile, ½-1 in. long, fleshy, obtuse . . . 2. *B. molluginifolia*.

Flowers in strobiliform spikes.—A small shrub with a very short stem . . . 3. *B. indica*.

1. *B. boerhaviæfolia*, Pers. Syn. ii, 189; Royle Ill. 298; F. B. I. iv, 478; Prain Beng. Pl. 799; Cooke Fl. Bomb. ii, 359. *Acanthus madagascariensis*, Linn.; Royle Fl. Ind. iii, 33.

A prostrate roughly pubescent herb. Stems much-branched, wiry, rooting at the nodes. Leaves petioled, thin, 4 in a whorl, unequal, 1-2½ in. long, elliptic or obovate, acute and finely apiculate, appressedly hairy above, lower surface paler and with hairs only on the nerves; margins entire or with a few distant teeth, ciliate. Flowers axillary, solitary or 2 or 3 together; bracteoles 8, in opposite pairs, becoming larger upwards; outermost pair ½ in. long, second ⅓ in., third ¼-½ in., all 3 pairs cuneiform below, broadly spatulate and rounded at the apex, strongly 3-nerved, furnished on the upper margin with stiff retrose bristles; the fourth or innermost pair of bracteoles longer than the others, linear with a flat rounded apex; all four pairs of bracteoles white with green veins. Calyx-segments ¼-½ in. long, lanceolate, acute, pubescent and ciliate, the largest one 3-nerved, the opposite one 2-fid. and 2-nerved, the 2 lateral ones with a single nerve running down the centre. Corolla ½-⅔ in. long, blue or pinkish-purple spotted with yellow on the lower lip. Capsule ¼-½ in. long, usually 2-seeded. Seeds obtusely echinate.

Not uncommon within the area, but mostly in dry or rocky ground; Moradabad (T. Thomson), Saharanpur district (Royle), Siwalik range (Falconer), Agra (Muuro), Bundelkhand (Edgeworth), Ajmer (Lowrie), Merwara (Duthie). Flowers during the cold season. DISTRIB. From Mt. Abu and Chota Nagpur to S. India and Ceylon, also in Burma and extending to Trop. and S. Africa.

2. *B. molluginifolia*, Pers. Syn. ii, 189; Royle Ill. 298; F. B. I. iv, 479; Prain Beng. Pl. 799; Cooke Fl. Bomb. ii, 359.

Stems slender, prostrate, wiry, more or less hispid. Leaves ½-1 in. long, sessile or nearly so in a whorl of four, unequal, fleshy, oblong or obovate, obtuse, mucronate, hairy or minutely scabrous, pale beneath. Heads usually 1-flowered; bracteoles 10, in opposite pairs, enlarging in size upwards, varying in length from ⅓ to ½ in., the 4 outer pairs very similar to those of the preceding species, the 5th or innermost pair oblong or oblong-spatulate, tipped with a spinulose mucro about ⅓ in. in length with sometimes one or two shorter ones alongside. Calyx-segments linear-lanceolate, acute, margins membranous, nervation as in the preceding species. Corolla blue, ⅓ in. long. Capsule included, ½ in. long, ellipsoid, 2-seeded. Seeds shaggy.

Abundant within the area, especially in the drier south-western and western portions. DISTRIB. Chota Nagpur and southwards through C. W. and S. India to Ceylon, extending to Trop. and S. Africa.

3. *B. sindica*, T. Anders. in Journ. Linn. Soc. ix, 500; F. B. I. iv, 479; Cooke Fl. Bomb. ii, 359.

A small shrub, somewhat spinose-bristly. *Stem* usually very short or none; branches slender, clothed with short grey pubescence. *Leaves* sessile in whorls of four, unequal, 1-2½ in. long, linear, acute, finely apiculate, roughly hairy, margins often with a few spine-like teeth near the base. *Spikes* strobilate, hairy, 1-3 in. long, in the forks of the branches, solitary in the upper forks and usually numerous in the lowest one; peduncle stout, woody; bracts in four rows, ½-1 in. long, the lowest the smallest, ovate, abruptly acuminate and spinous-pointed at the apex, hairy on the both sides, armed towards the apex with slender usually recurved spines, nerves 5 bracteoles 2, shorter than the bracts, lanceolate, acute, hairy and ciliate, reticulate-veined. *Calyx* softly hairy on both sides; largest segment ½ in. long, ovate, bluntly acuminate, the apex truncate and densely ciliate; nerves 7, the 3 central ones parallel, each ending in a bristly tooth; the opposite calyx-segment ⅔ in. long similar in shape, the 3 parallel nerves not produced; lateral segments ⅓ in. long, ovate, acute, 1-nerved. *Corolla* about ½ in. long, mid-lobe of lower lip quadrate, twice as large as the rounded lateral ones; tube ½ in. long, constricted below the limb. *Capsule* ⅓ in. long, ellipsoid, compressed, shining, 2-seeded. *Seeds* ⅓ in. long, densely clothed with long stout hairs.

Ajmer (Duthie). Flowers during the end of the rainy season. *DISTRIB.* Punjab, Sind and Gujarat. Reduced by Clarke in "Fl. Trop. Africa" to the African *B. lineariaefolia*, Pers., but, as Dr. Cooke points out, the corolla is very different.

## 6. ASTERACANTHA, Nees.

UNDER HYGROPHILA IN FL. BRIT. IND. IV, 408.

A stout herb, growing in wet ground. *Stems* many, fascicled, spinous at the nodes. *Leaves* narrow, lanceolate, arranged in whorls of 6, the 2 outer leaves of each whorl larger. *Flowers* in sessile axillary whorls, surrounded by rigid spines, bracts leaf-like, bracteoles linear-lanceolate. *Calyx* deeply 4-partite, the upper segment broader. *Corolla* distinctly 2-lipped, upper lip 2-lobed; lower 3-lobed, with 2 crest-like folds on the palate. *Stamens* didynamous; anthers 2-celled, equal; the cells parallel, glabrous, muticous. *Ovary* with 4 ovules in each cell, style hairy; stigma simple, acuminate. *Fruit* a compressed linear-oblong capsule. *Seeds* 4-8, clothed with white hygroscopic hairs, retinacula hard.—A single species, -found in India, Ceylon and in Trop. and S. Africa.

*A. longifolia*, Nees in Wall. Pl. As. Rar. iii, 90; Royle Ill. 298; Lindau in Engl. and Prantl. Pflanzenf. iv, 3 B, 297; Cooke Fl. Bomb. ii, 352. *Hygrophila spinosa*, T. Anders.; F. B. I. iv, 408; Watt E. D.; Collett, Fl. Siml. 371; Prain Beng. Pl. 802. *Ruellia longifolia*, Roxb. Fl. Ind. iii, 50.

*Stems* erect, 2-5 ft. high, more or less hispid with long hairs especially at the base of each node. *Leaves* subsessile, the 2 outer of each whorl up to 7 in. long, oblong-lanceolate or oblanceolate, sparsely hispid on both sides with long white hairs, each of the 6 leaves with a long sharp nearly straight yellow spine in its axil. *Flowers* in a whorl of 8 (four pairs) at each node; bracts about 1 in. long, lanceolate, ciliate; bracteoles smaller, linear-lanceolate. *Calyx-segments*  $\frac{3}{4}$ - $\frac{1}{2}$  in. long, linear-lanceolate, hairy outside and with hyaline ciliate margins, the upper broader and rather longer than the other three. *Corolla* 1-1 $\frac{1}{4}$  in. long, pale bluish-purple or white; tube  $\frac{1}{2}$  in. long, abruptly dilated above, lips subequal. *Capsuls*  $\frac{1}{2}$  in. long, linear-oblong, pointed.

Common over the greater portion of the area, in ditches and swampy ground. **DISTRIB.** Throughout India and in Ceylon, also at Singapore and extending to Trop. and S. Africa. The whole plant, including the root and seeds, is valued by natives for certain medicinal properties.

## 7. *HYGROPHILA*, R.Br.; Fl. Brit. Ind. iv, 406.

Herbs, usually found in wet places. *Leaves* opposite, lanceolate or obovate, entire. *Flowers* bluish-purple, sessile, in terminal heads or axillary whorls; bracts elliptic or lanceolate; bracteoles linear or lanceolate, shorter than the calyx. *Calyx* tubular, 5-fid., rarely 4-partite, lobes linear or lanceolate. *Corolla* 2-lipped, nearly glabrous, tube dilated above, lobes twisted to the left in bud. *Stamens* didynamous, the posterior pair sometimes smaller or rudimentary, filaments glabrous, anthers oblong; cells equal, diverging or connate at the base. *Ovary* oblong, tip hairy; style slender, hairy; stigma simple, linear; ovules few or many in each cell. *Fruit* a linear or narrowly oblong capsule, bearing the seeds from near the base. *Seeds* usually, many, ovoid, compressed, hygroscopically hairy; retinacula hard, curved, acute.—Species about 30, in tropical and subtropical regions of both hemispheres.

*Flowers* in terminal spikes.—Procumbent herbs:—

Fertile stamens 2, upper pair reduced to teeth,

leaves usually glabrous, seeds 20 or more . . . 1. *H. polysperma*.

Fertile stamens 4, leaves hairy, seeds 8-10 . . . 2. *H. Serpyllum*.

*Flowers* in axillary whorls, stamens 4, seeds

20 or more.—An erect herb . . . 3. *H. angustifolia*.

1. *H. polysperma*, T. Anders. in Journ. Linn. Soc. ix, 456; F. B. I, iv, 406; Collett Fl. Siml. 371; Prain Beng. Pl. 801; Cooke Fl. Bomb. ii, 35, 3. *Justicia polysperma*, Roxb.; Fl. Ind. i, 119.

A small much-branched procumbent herb, branching and rooting near the base. *Leaves* subsessile,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, narrowly oblong to ovate, sub-obtuse at the apex and tapering to the base, entire or almost so, usually glabrous. *Flowers* in dense terminal oblong spikes 1-4 in. long; bracts  $\frac{1}{4}$ - $\frac{1}{2}$  in., elliptic-oblong, obtuse, hairy on both sides, mid-nerve prominent; bracteoles  $\frac{1}{4}$  in., linear. *Calyx*  $\frac{1}{2}$  in. long, pubescent; teeth linear, with scarious ciliate margins. *Corolla*  $\frac{1}{2}$  in. long, pale-blue or white, pubescent. *Fertile Stamens* 2, the upper reduced to teeth. *Capsule*  $\frac{1}{2}$  in. long, narrowly oblong, glabrous. *Seeds* 20-30.

Very common in most parts of the area in wet places, flowering during the rains. **DISTRIB.** Throughout India, ascending to 4,000 ft. on the Himalaya; extending to Afghanistan, Malacca and Tonkin.

2. *H. Serpyllum*, T. Anders. in Journ. Linn. Soc. ix. 456; F. B. I. iv, 406; Prain Beng. Pl. 801; Cooke Fl. Bomb. ii, 354.

Rootstockwoody. *Stems* procumbent, 4-15 in. long, glabrous or slightly hairy. *Leaves*  $\frac{3}{4}$ - $1\frac{1}{4}$  in. long, elliptic or suborbicular, entire, more or less hairy on both sides, petioles of the basal leaves up to 1 in. long. *Flowers* in dense or rather lax spikes; bracts  $\frac{1}{4}$  in. long, elliptic, subacute, hairy; bracteoles  $\frac{1}{4}$  in. long, oblong or oblong-lanceolate. *Calyx*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long; lobes linear, densely ciliate. *Corolla*  $\frac{1}{2}$  in. long; upper lip shorter than lower, with 2 short obtuse lobes; lower bullate, shortly 3-lobed. *Fertile stamens* 4, anthers of the 2 lower larger. *Capsule*  $\frac{1}{4}$  in. long, pointed glabrous, 8-10 seeded.

Bundelkhand and Malwa (Edgeworth), recorded also from Guna in C. India (King) and from Sangor (Jerdon). Flowers during the cold season. **DISTRIB.** From Behar and C. Provinces to W. and S. India.

3. *H. angustifolia*, R. Br. Prod, 479; Cooke Fl. Bomb. ii, 354. *H. salicifolia*, Nees; F. B. I. iv. 407, Watt E. D.; Prain Beng. Pl. 804. *Ruellia salicifolia*, Vahl; Roxb. Fl. Ind. iii, 50.

A much-branched erect herb, 1-3 ft. high. *Stems* bluntly 4-angular, nearly glabrous. *Leaves* sessile or shortly petioled, glabrous,  $\frac{1}{2}$ -3 in. long; lower obovate or oblong, upper lanceolate. *Flowers* in dense rather distant axillary whorls; bracts  $\frac{1}{4}$  in. long, ovate or oblong, subobtuse, hairy; bracteoles about half as long as the calyx, lanceolate, acute, hairy. *Calyx*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, divided  $\frac{1}{2}$  way down in flower; teeth linear from a broad base, acute, hairy; margins hispid, ciliate. *Corolla*  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, pale-purple, hairy outside; tube abruptly swollen above, hairy inside at the base of the stamens. *Stamens* 4, all fertile. *Style* pubescent. *Capsule* longer than calyx, narrow, subquadrangular, 20-28-seeded.

Common in wet ground in most parts of the area. **DISTRIB.** Throughout the greater part of India and in Ceylon, extending to China and Japan. The leaves are sometimes eaten by natives as a pot-herb.

## 8. RUELLIA, Linn.; Fl. Brit. Ind. iv, 411.

Herbs or undershrubs. *Leaves* opposite, entire. *Flowers* sessile or subsessile, solitary or in clusters or racemes; bracts none; bracteoles large, usually exceeding the calyx. *Calyx* 5-partite or 5-fid.; lobes subequal, narrow, acute. *Corolla* more or less oblique, tube ventricose; lobes subequal, rounded, twisted to the left in bud, spreading in flower. *Stamens* didynamous; filaments glabrous or hairy at the base; anthers subequal, 2-celled; cells oblong, mucous, glabrous. *Ovary* glabrous; ovules 3-10 in each cell; style linear, hairy, unequally bifid. *Fruit* a clavate cylindric or ellipsoid capsule, seed-bearing above the solid base. *Seeds* large, thin, discoid, margined, hygroscopically hairy; retacula large, hooked, strong.—Species about 200, in all warm regions. The above generic description refers only to the section *Dipteracanthus*, to which all the Indian species belong.

Stems prostrate or climbing, woody; leaves ovate or elliptic, acute, glabrous or slightly hairy; flowers greyish-purple; capsule pubescent . . . . . 1. *R. prostrata*.

Stems erect, woody; leaves ovate, obtuse, rather densely pubescent on both surfaces; flowers greyish-purple, capsule glabrous below the tip . . . . . 2. *R. patula*.

Stems annual, erect from a woody rootstock; leaves narrowly elliptic, subobtuse, villous on both surfaces; flowers white; capsule glabrous . . . . . 3. *R. suffruticosa*.

1. *R. prostrata*, Lamk. *Encycl.* vi, 349, VAR. *dejecta*, Clarke in *F. B. I.* iv, 412; Watt *F. D.*; Prain *Beng. Pl.* 803; Cooke *Fl. Bomb.* vi, 355. *R. ringens* Roeb. *Fl. Ind.* iii, 44.

A small diffuse undershrub. *Stems* 6-18 in. long, prostrate or climbing, amongst bushes, much branched, internodes long, the nodes more or less hairy and often tinged with purple. *Leaves*  $\frac{1}{2}$ -3 in. long, ovate or elliptic, acute at both ends, entire, glabrous or slightly hairy, petioles  $\frac{1}{4}$ - $\frac{3}{4}$  in. long. *Flowers* subsessile, solitary or few together; bracteoles similar to the leaves but smaller. *Calyx*  $\frac{1}{2}$  in. long, divided to below the middle; segments linear-subulate, acute, hairy. *Corolla* pale greyish-purple,  $1\frac{1}{2}$  in. long, caducous, pubescent outside; tube narrowly cylindric below, funnel-shaped above; lobes subequal, obovate-oblong, rounded. *Capsule*  $\frac{1}{2}$  in. long, clavate, pointed, pubescent. *Seeds* 16-20, subglabrous, but with a dense fringe of hygroscopic hairs on the margin.

Abundant within the area, especially in bushy places. Flowers during several months of the year. **DISTRIB.** Throughout India from the Punjab and Assam to Ceylon, extending to E. Africa. The plant is used by natives as a remedy for diseases of the ear.

**2. R. patula**, Jacq. *Misc. Bot.* ii, 353; Roxb. *Fl. Ind.* iii, 45; F. B. I. iv, 412; Cooke *Fl. Bomb.* ii, 656.

A small hoary-pubescent shrub. Stems erect or long and straggling, much-branched, densely and closely pubescent. Leaves  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, ovate or elliptic, obtuse and sometimes apiculate, rounded at the base or abruptly narrowed, closely pubescent on both surfaces, petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. Flowers subsessile, solitary or 2-3 together in the axils; bracteoles leaflike, less than  $\frac{1}{2}$ -in. long (including the short flat stalk), elliptic, obtuse, densely pubescent and ciliate. Calyx 5-partite,  $\frac{1}{4}$  in. long, densely pubescent; segments linear-lanceolate, very acute. Corolla pale greyish-purple, 1-1 $\frac{1}{4}$  in. long, hairy outside; tube narrowly cylindric below, funnel-shaped above; lobes  $\frac{1}{4}$ -in. long, elliptic or suborbicular. Ovary glabrous except the tip, style hairy. Capsule  $\frac{1}{2}$  in. long, clavate, glabrous. Seeds suborbicular, nearly glabrous, but with a dense fringe of hair on the margin.

Common in uncultivated ground, chiefly in the drier western portion of the area, as in Bundelkhand and Merwara and in the ravine tracts skirting the districts of Delhi, Agra and Etawah. Flowers during the hot and rainy seasons. **DISTRIB.** Punjab Plain, Rajputana, Sind and southwards through the drier portions of W. and S. India to Ceylon, extending to Arabia, Tropical Africa and Ava.

**3. R. suffruticosa**, Roxb. *Fl. Ind.* iii, 53; F. B. I. iv, 413; Watt *E. D.*; Prain *Beng. Pl.* 803. *Dipteracanthus* Sibua, Nees in *Wall. Pl. As. Rar.* iii, 81.

An erect pubescent undershrub, 1-2 ft. high. Roots stout, often with fusiform swellings. Stems herbaceous, annually produced from a short creeping woody rhizome. Leaves petioled, lanceolate elliptic or oblanceolate, the lower ones usually smaller and often suborbicular, obtuse or subacute, entire, villous with white hairs on both surfaces especially on the nerves and veins beneath, margins ciliate. Flowers solitary, terminal, subsessile; bracteoles resembling the leaves but smaller and narrower,  $\frac{1}{2}$  in. long, stalked. Calyx-segments  $\frac{1}{4}$  in. long, linear, puberulous or nearly glabrous. Corolla white, 1 $\frac{1}{2}$ -2 in. long, tube slender, limb subregular. Capsule 1 $\frac{1}{2}$  in. long, oblong, glabrous, often tinged with purple. Seeds few.

Saharanpur district (Royle), Moradabad (T. Thomson), also in the fire-exposed tracts of Pilibhit, N. Oudh and Gorakhpur (Duthie). Flowers April to July. Roxburgh states that the flowers open at sunset and drop off on the following morning. **DISTRIB.** N. and W. Bengal and in Chota Nagpur, also in Upper Burma (Collett). The roots of this plant are said to be used by the Santals for producing fermentation in the grain from which they manufacture their beer. Similar tuberous roots occur in the



closely allied *R. cornuta*, as well as in *R. tomentosa*, a native of America and now naturalized in C. Bengal. See also under *Etobium Linnaea* 1871.

### 9.—ÆCHMANTHERA, Nees; Fl. Brit. Ind. iv, 428.

Small villous shrubs. *Leaves* broadly elliptic, acute, crenate, often viscid. *Flowers* pale-violet or purplish, in sessile close or distant clusters arranged on the branches of a 3-chootomous or 1-sided panicle; bracts linear, as long as the calyx; bracteoles, similar, smaller. *Calyx* 5-partite; segments linear, subequal. *Corolla* nearly straight; tube cylindric at the base, suddenly widened near the middle, palate with 2 hairy lines within; lobes 5, subequal, rounded, twisted to the left in bud. *Stamens* didynamous, included, longer filaments hairy; anthers ovate or oblong, 2-celled, cells blunt, connective sometimes produced. *Ovary* densely hairy at the apex; style sparsely hairy, thickened upwards, stigma large, simple, linear-lanceolate, ovules 4-6 in each cell. *Fruit* a narrowly oblong capsule, seed-bearing from the base. *Seeds* 6-8 (sometimes 12), discoid and densely hairy, or thicker and glabrous; retinacula strong, hooked.—Species 2, both Indian.

*A. tomentosa*, Nees in Wall. Pl. As. Rar. iii, 87; F. B. I. iv, 428; Kanjilal For. Fl. 257; Gamble Man. Ind. Timb. 518.

A small erect shrub, 1-3 ft. high, clothed with grey or whitish (not snowy white) hairs. *Leaves* petioled, 2-4 in. long, elliptic or lanceolate, acute, slightly crenate, base rounded; upper surface coarsely pubescent, lower densely grey-tomentose. *Flowers* arranged in small 3-8-flowered clusters which are sessile along the spreading branches of a large terminal panicle; bracts  $\frac{1}{2}$  in. or more long, linear, glandular-hairy, bracteoles similar but smaller. *Calyx*  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, segments linear, glandular-hairy. *Corolla* pale-blue, 1 in. long; lobes spreading, about  $\frac{1}{2}$  in. across. *Antthers* with the connective very slightly excurrent. *Capsule* about as long as the calyx, linear, usually 8-seeded.

Summit of Siwalik range. Flowers during the cold season. **DISTRIB.** W. Himalaya, up to 5,000 ft. in Kumaon, also in Nepal.

**VAR. Wallichii**, F. B. I. iv, 428; Watt E. D., Kanjilal l.c.; Gamble l.c.; Prain Beng. Pl. 804. *Æ. gossypina*, Nees; Royle Ill. 298. Vern. Bharara. —Stems and leaves densely clothed with snow-white wool. *Antthers* with the connective distinctly excurrent. —Dehra Dun and Siwalik range. Flowers in the late autumn, and abundantly every 4 and 5 years after the manner of some species of *Strobilanthes*. **DISTRIB.** W. Himalayan, Simla to Kumaon up to 5,000 ft., also in N. Bengal and Chittagong. Madden says that bees are particularly fond of the flowers of this plant. It usually

grows gregariously, and is therefore a conspicuous feature during the periods of profuse flowering. The thick white wool which covers the stems and the under surfaces of the leaves is much used by the natives for making a kind of cloth. The wool when young is often tinged with lilac.

# 10. HEMIGRAPHIS, Nees, Fl. Brit. Ind. iv, 422.

Herbs or shrubs. *Leaves* opposite, toothed or subentire. *Flowers* blue or yellow, sessile, in heads or spikes, rarely solitary; heads terminal or pseudo-axillary on shortened branchlets, rarely in panicles or solitary; bracts large, imbricate, each 1-flowered; bracteoles small, narrow or none. *Calyx* 5-partite nearly to the base; segments subequal, lanceolate or linear. *Corolla* elongate, tube cylindric below, funnel-shaped or ventricose above; lobes 5, sub-equal, rounded, twisted to the left in bud. *Stamens* didynamous, included or nearly so; anthers oblong, 2-celled, muticous, sometimes triangular, bases acute. *Ovary* with 3-many ovules in each cell, style long, stigma unequally 2-lobed. *Fruit* a linear or linear-oblong capsule, seed-bearing almost from the base. *Seeds* 6 to 20, compressed, discoid, brown with a white margin.—Species about 30, Indian and Malayan, & three in Africa.

Corolla-limb ventricose, longer filaments hairy below :—

- |   |   |
|---|---|
| Bristly, corolla purplish . . . . .   | 1. <i>H. dura</i> .                                 |
| Softly hairy, corolla pale blue . . . . .   | 2. <i>H. hirta</i> .                                |
| Corolla-tube narrowly funnel-shaped throughout,<br>longer filaments densely bearded in their upper half | 3. <i>H. latebrosa</i> ,<br>var. <i>rupestris</i> . |

1. *H. dura*, T. Anders. in Journ. Linn. Soc. ix, 461 (excl. syn. *Ruellia crispa*); F. B. I. iv, 422; Cooke Fl. Bomb. ii, 357.

A procumbent or diffuse herb, hispid or almost prickly. *Stems* 1-2 ft. high, clothed with stiff white deflexed bristles. *Leaves* hispid, 1-1½ in. long, spatulate-oblong, obtuse, subcrenate, tapering below into a short petiole. *Heads* many-flowered, densely clothed with white and yellowish-brown hair; bracts ¾-1 in. long, oblong or spatulate, subacute, densely hairy. *Calyx* ½ in. long; segments linear, acute, densely hairy and ciliate with jointed hairs. *Corolla* ¾ in. long, blue; tube slender, lower cylindric portion about as long as the upper ventricose part; lobes obovate, rounded. *Filaments* (the longer ones) laxly hairy below. *Ovary* glabrous, style hairy. *Capsule* ½ in. long, glabrous, 6-8-seeded.

Bundelkhand (Duthie). Flowers in the cold season. **DISTRIB.** C. India in black soil (Edgeworth), Sind, Gujarat, Konkan and C. Provinces to S. India.

2. *H. hirta*, T. Anders. in Journ. Linn. Soc. ix, 462; F. B. I. iv, 422; Prain Beng. Pl. 805. *Ruellia hirta*, Vahl; Roxb. Fl. Ind. iii, 46.

Δ softly pubescent herb. Stems 6-18 in. long, creeping, 4-sided. Leaves  $\frac{1}{2}$ -1 in. long, ovate or oblong, crenate. Heads 2-6 flowered or the flowers occasionally solitary; bracts  $\frac{1}{2}$  in., elliptic, pubescent, bracteoles none. Calyx  $\frac{1}{2}$  in. long, green; segments (in fruit) spatulate. Corolla pale-blue,  $\frac{1}{2}$  in. long, soon falling, glabrous except for the 2 lines of hairs on the palate, the swollen upper portion nearly as long as the cylindric base; lobes subequal, obliquely oval. Filaments (the longer ones) laxly hairy below. Style hairy. Capsule  $\frac{1}{2}$  in. long, linear, about 12-seeded, glabrous.

Abundant in most parts of the area. Flowers in early part of the hot season. DISTRIB. Behar and in C. and W. Bengal; W. Himalaya, up to 5,000 ft. in Kumaon.

3. *H. latebrosa*, Nees in DC. Prod. xi, 723, VAR. *rupestris*, C. B. Clarke in F. B. I. iv, 423; Prain Beng. Pl. 805; Cooke Fl. Bomb. ii, 358.

Δ diffuse rather rigid viscidly pubescent herb. Stems slender, obtusely 4-angled, clothed with soft white hairs. Leaves petioled, 1-3 in. long, ovate, acuminate, crenate-serrate, tapering towards the base, petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, leaves; of the flowering branches much smaller. Flowers in rather dense heads; bracts ovate or elliptic, acute, hairy and with ciliate margins, the outer ones largest. Calyx  $\frac{1}{2}$  in. long, linear, acute, whitish with green tips, hairy and with ciliate margins, one segment larger than the others. Corolla about  $\frac{1}{2}$  in. long, narrowly funnel-shaped and nearly straight; tube yellowish, limb blue; lobes obovate, obtuse. Filaments (the longer ones) densely woolly above. Capsule  $\frac{1}{4}$  in. long, puberulous, 6-seeded. Seeds hairy.

Dehra Dun and Siwalik range, Bundelkhand (Duthie), in shady places. DISTRIB. W. Himalaya up to 5,000 ft.; also in Behar, Rajputana, C. Provinces, Bombay and S. India.

## 11. PETALIDIUM, Nees; Fl. Brit. Ind. iv, 416.

Undershrubs, minutely pubescent. Leaves ovate or narrowly oblong, entire or toothed. Flowers solitary, sessile or nearly so, usually crowded on short lateral branches; bracts narrow; small or none; bracteoles large, ovate, reticulate-veined, at length scarious. Calyx unequally 5-fid. or 5-partite, segments narrowly lanceolate. Corolla straight or curved, dilated upwards or funnel-shaped at the top; lobes 5, rounded, twisted to the left in bud, spreading in flower. Stamens didynamous; anthers subsimilar, 2-celled; cells parallel, spurred at the base. Ovary with 2 ovules in each cell, style linear, stigma unequally 2-lobed. Fruit a clavate capsule, compressed parallel to the septum. Seeds 2 or 4, discoid, hygroscopically hairy;

placentas separating elastically from the base of the capsule, carrying the seeds with them; retinacula hard, curved.—Species 18, one India, the rest in Africa and the Mascarene Islands.

*P. barlerioides*, Nees in Wall. Pl. As. Rar. iii, 82; Royle III. 29. F. B. I. iv, 416; Kanjal For. Fl. 261; Gamble Man. Ind. Timb. 51. Collett Fl. Siml. 371; Prain Beng. Pl. 805; Cooke Fl. Bomb. ii, 3. *Ruellia bracteata*, Roxb. Fl. Ind. iii, 47.

An undershrub, 4-5 ft. or more, minutely hairy. Stems several, straight, woody, subterete, glabrous. Leaves on the main stems 2-4 in. long, broadly ovate, acuminate, crenate-serrate, glabrous except on the nerves and veins beneath; main lateral nerves 6-8 pairs, prominent beneath; petioles about  $\frac{1}{2}$  in. long; leaves on the shortened flowering branches much smaller. Bracts none, bracteoles leaf-like,  $\frac{3}{4}$  in. long, ovate, acuminate, strongly nerved and veined, scarious when old, margin ciliolate, pedicels  $\frac{1}{2}$  in. long. Calyx glandular-hairy, about  $\frac{3}{4}$  in. long. Corolla  $1\frac{1}{2}$  in. long, yellowish-white, hairy outside, the palate clothed within with long deflexed fulvous hairs, tube dilated upwards; lobes obovate, obtuse, the margins crenate. Filaments hairy at the base, anthers slightly pubescent. Ovary glabrous, style hairy. Capsule  $\frac{1}{2}$  in. long, compressed, glabrous. Seeds usually 2, clothed with soft hair along the margins.

Delhra Dun and Siwalik range and eastwards through the Sub-Himalayan tracts of N. Oudh, also in Bundelkhand and Merwara. Flowers March-May. DISTRIB. W. Himalaya up to 3,000 ft.; also in Chota Nagpur, Rajputana, and in C. & W. India and in the Bombay Presidency.

## 12. DYSCHORISTE, Nees.

UNDER CALOPHANES IN FL. BRIT. IND. IV, 410.

Perennial herbs. Leaves opposite, petioled. Flowers in axillary clusters or short cymes; bracteoles, small, narrow. Calyx tubular, lobes 5, subequal, lanceolate or subulate. Corolla tubular, obscurely 2-lipped; lobes 5, obtuse, twisted to the left in bud, spreading in flower. Stamens didynamous, perfect, filaments glabrous or hairy, anthers similar, 2-celled; cells oblong, parallel, minutely mucronate or spurred at the base; pollen globose, ribbed. Ovary glabrous, ovules 2 in each cell; style linear, hairy; stigma linear, the upper lobe minute or obsolete. Fruit an oblong capsule, narrowed below into a short solid base. Seeds 4, orbicular, much compressed, hygroscopically hairy when moistened; retinacula strong, curved.—Species 60, in S. E. Asia, Tropical Africa and America.

*D. depressa*, Nees in Wall. Pl. As. Rar. iii, 81; Cooke Fl. Bomb. ii, 361. *Calophanes Nagchana*, Nees; F. B. I. iv, 410; Prain Beng. Pl. 806. Vern. Nagchana.

A perennial herb or suffrutescent. *Stems* many, glabrous or hoary, sub-erect or decumbent, branches usually prostrate and rooting at the nodes. *Leaves* 4-14 in. long, broadly elliptic or obovate, obtuse, entire, tapering into the petiole, glabrous or nearly so. *Flowers* subsessile, in axillary clusters; bracts none; bracteoles  $\frac{1}{2}$  in. long, linear. *Calyx*  $\frac{1}{2}$ -1 in. long, divided more than  $\frac{1}{2}$  way down in flower, hairy; segments lanceolate-subulate, the margins membranous towards the base. *Corolla* pale violet-pink, rather shorter than the calyx; lobes spreading, oblong, rounded or truncate. *Filaments* with the filaments connate in pairs at the base, subsericeous, shortly mucronate. *Capsule*  $\frac{1}{2}$  in. long, glabrous.

Every district of N. Oudh (Duthie), also in Bundelkhand (Mrs. Bell). Flowers March and April. *DISTRIB.* Bengal and in W. and S. India to Cape, according to Tropical Africa.

### 13. *DEDALACANTHUS*, T. And.; Fl. Brit. Ind. iv, 417.

Perennial herb or shrubs. *Leaves* opposite, petioled, entire or obscurely toothed, lined with from embedded raphides. *Flowers* blue or rose-colored, in linear distant or close spikes or in heads; bracts usually large; bracteoles linear-lanceolate, shorter than the calyx. *Calyx* 5-lobed; lobes narrow, often scarious. *Corolla* slender; tube long, narrow, widened near the top or (in a few species) from the middle; lobes obovate, twisted to the left in bud, spreading in flower. *Stamens* 2, glabrous, anthers narrowly oblong, 2-celled, muticous, exserted or subincluded. *Ovary* glabrous, 4-ovuled; style long, sparsely hairy; stigma simple, linear. *Fruit* a clavate capsule with a cylindrical style. *Seeds* normally 4, compressed, discoid, hygroscopically hairy, reticula acute.—Species 18, in India and Malaya.

Spikes forming a close terminal panicle;  
bracts elliptic, subobtusate or shortly  
acuminate, not ciliate . . . . . 1. *D. nervosus*.

Spikes usually solitary; bracts ovate,  
much acuminate, ciliate . . . . . 2. *D. purpurascens*.

1. *D. nervosus*, T. And. re. in Journ. Linn. Soc. ix, 487; Royle III. 298; P. B. I. iv, 415; Wall. L. D.; Kanjilal For. Pl. 261; Gamble Man. Ind. Trib. 518; Coll. Fl. Siml. 571; Prain Beng. Pl. 807.

A stout herb, 2-6 ft. high, with 4-angled scabrous stems. *Leaves* 6-8 in. long, ovate, acuminate, entire or crenulate, linear-lanceolate, glabrous but scabrous on the nerves beneath, base attenuate, petiole  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. *Flowers* in short uninterrupted bracteate spikes forming close terminal panicles; peduncles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, often acutely 4-angled, glabrous or obscurely pubescent; bracts more or less white, with green nerves, about  $\frac{1}{2}$  in. long, ovate or elliptic, subobtusate or shortly acuminate, puberulous, the margins not ciliate; bracteoles shorter than the calyx, narrowly lanceolate. *Calyx*  $\frac{1}{2}$  in. long, lobed half-way down, whitish, minutely

but densely pubescent; lobes lanceolate. *Corolla* deep-blue,  $1\frac{1}{4}$  in. long, glabrous; tube elongate, dilated near the top; limb oblique,  $\frac{2}{3}$  in. across; lobes subequal, rounded. *Anthers* exserted. *Capsule* oblong,  $\frac{1}{2}$  in. long.

Dehra Dun and in the Sub-Himalayan tracts of Pilibhit N. Oudh and Gorakhpur, frequent in *sal* forests. Flowers during February and March. **DISTRIB.** Subtropical Himalaya from the Punjab to Bhutan, extending to 4,000 ft. in Kumaon; also in N. Bengal, Chota Nagpur and the Sundribuns. Often cultivated in gardens for its handsome dark-blue flowers.

2. *D. purpurascens*, T. Anders. in Journ. Linn. Soc. ix, 488; F. B. I. iv, 420; Watt E. D.; Kanjilal For. Fl. 261; Gamble Man. Ind. Timb. 518; Prain Beng. Pl. 807; Cooke Fl. Bomb. ii, 364. *Eranthemum pulchellum*, Roxb. Fl. Ind. i, 111.

A stoutish herb. *Stems* 2-4 ft. high, leafy. *Leaves* up to 8 or 9 in. long, ovate, acuminate, closely lineolate on both surfaces, glabrate or sometimes pubescent on the nerves, lamina of lower leaves more or less decurrent into the petiole, upper with a rounded or cordate base and shortly stalked; main lateral nerves 7-9 pairs, prominent beneath. *Flowers* in dense usually solitary spikes which are 1-3 in. long; bracts glandular-pubescent, about 1 in. long, ovate-lanceolate, long-acuminate, pale-green or becoming whitish when old; nerves strong, dark-green, connected with fine reticulations, margins ciliate; bracteoles smaller, linear-lanceolate, scarious and glandular-pubescent. *Calyx*  $\frac{1}{4}$ - $\frac{1}{2}$  in., lobed about half-way down, scarious and minutely pubescent on both sides; lobes narrowly lanceolate, acute. *Corolla* bluish-purple or lilac,  $1\frac{1}{4}$  in. long, hairy outside, tube slightly funnel-shaped; lobes  $\frac{1}{2}$  in. long, obovate, rounded or truncate. *Stamens* slightly exserted. *Capsule*  $\frac{1}{2}$ - $\frac{2}{3}$  in. long, glabrous.

Gorakhpur (Brandis), Bundelkhand (Duthie and Mrs. Bell). **DISTRIB.** From Assam and Behar throughout the hilly parts of Northern W. and S. India and in Ceylon. A handsome plant when in flower and often grown in gardens.

#### 14. STROBILANTHES, Blume; Fl. Brit. Ind. iv, 429.

Shrubs or herbs. *Leaves* opposite, often unequal, toothed or subentire, often containing raphides. *Flowers* purple or white, rarely yellow, capitate or in strobilate or interrupted spikes or panicles, sessile or pedicelled; bracts and bracteoles large or small or none, persistent or caducous. *Calyx* deeply subequally 5-partite, rarely 2-lipped, segments narrow. *Corolla* straight or curved, tube ventricose above; lobes 5, ovate or rounded, subequal, twisted to the left in bud. *Stamens* usually didynamous; anthers oblong, 2-celled, muticous. *Disk* small, or prominent as a stalk to the ovary. *Ovary* with 2 ovules in each cell; style linear, stigma of one long linear

linear,  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, pubescent. Corolla purple, about 1 in. long, nearly glabrous, mouth curved. Capsule  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, 4 seeded. Seeds orbicular, less than  $\frac{1}{2}$  in. diam., hairy.

Common in Dehra Dun and on the Siwalik Range. Flowers Jan. to Mar. **DISTRIB.** Outer hills of the Punjab Himalaya up to 6,000 ft. This species differs from *S. alatus* by the attenuated (never cordate) base of the uppermost leaves, the more slender corolla and the smaller seeds.

3. *S. pentstemonoides*, T. Anders. in Journ. Linn. Soc. ix, 477 (in part); F. B. I. iv, 400; Kanjilal For. Fl. 258; Gamble Man. Ind. Timb. 519.

A much-branched glabrous shrub, 3-8 ft. in circumference. Leaves 5-8 in. long, elliptic, acuminate at both ends, closely serrate, lineolate and glabrous on both surfaces, main lateral nerves 7 pairs, petioles about  $\frac{1}{2}$  in. long. Peduncles solitary or in pairs, mostly 3-headed, 1-3 in. long, often glandular-hairy. Heads  $\frac{1}{2}$ -1 in. long, glandular when young; bracts white, suborbicular, concave,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, glabrous, caducous, bracteoles none. Calyx  $\frac{1}{2}$  in. long, often enlarging in fruit, deeply divided, segments linear. Corolla  $1\frac{1}{2}$  in. long, more or less curved, narrow portion of tube sometimes minutely pubescent. Capsule  $\frac{1}{2}$  in. long, oblong clavate, 4-seeded, glandular-pubescent. Seeds silky.

Dehra Dun, on the banks of the Re naddi (Kanjilal). Flowers in the rains. **DISTRIB.** Subtropical Himalaya from Nepal to Bhutan, up to 6,000 ft.

## 15. ANDROGRAPHIS, Wall.; Fl. Brit. Ind. iv, 501.

Erect or procumbent annuals, or small shrubs. Leaves entire. Flowers in lax panicles or in dense subcapitate axillary and terminal racemes, often unilateral; bracts small, bracteoles minute or none. Calyx 5-partite, segments narrow. Corolla small, tubular, 2-lipped, pubescent, lobes imbricate in bud. Stamens 2, filaments ciliate or setulose; anthers exserted, 2-celled; cells oblong, parallel, subequal, muticous, bearded at the base. Ovary sparsely hairy, style slender, stigma shortly 2-lobed; ovules 3-6 in. each cell. Fruit an oblong-linear or elliptic capsule, compressed at right angles to the septum. Seeds 6-12, hard, subquadrate or oblong, rugosely pitted, glabrous, retinacula lanceolate.—Species about 17, confined to India and Ceylon.

Leaves glabrous, flowers in lax paniced racemes,  
capsule glabrous

1 *A. paniculata*.

Leaves hairy, flowers in axillary racemes, capsule  
hairy

2. *A. echioides*.

1. *A. paniculata*, Nees in Wall. Pl. As. Rar. iii, 116; Royle Ill. 298; F. B. I. iv, 501, Watt E. D.; Prain Beng. Pl. 809; Cooke Fl. Bomb. ii, 374. *Justicia paniculata*, Burm.; Roxb. Fl. Ind. i, 117. Vern. Kulufnaih, kiryat.

An erect annual, 1-3 ft. high, branches sharply 4-angled or almost winged. *Leaves* 2-3 in. long, lanceolate, acute, tapering to the base, paler beneath, main lateral nerves 4-6 pairs, petioles none or up to  $\frac{1}{2}$  in. long. *Flowers* small, solitary, arranged in lax spreading axillary and terminal racemes or panicles, the whole forming a large paniculate inflorescence; pedicels distinct, gland-pubescent; bracts  $\frac{1}{10}$  in. long, lanceolate, bracteoles smaller or none. *Calyx*  $\frac{1}{8}$  in. long; segments equal, linear-lanceolate, gland-pubescent. *Corolla* pink,  $\frac{3}{8}$  in. long, hairy outside, tube  $\frac{1}{2}$  in. long, dilated below the limb. *Filaments* hairy upwards, anthers bearded at the base. *Capsule*  $\frac{5}{8}$  in. long, tapering at each end. *Seeds* several, subquadrate, rugose, glabrous.

In the districts of Shahjehanpur (Duhie) and Agra (Munro), also at Lucknow and in Bundelkhand (Edgeworth), often cultivated in gardens. *Flowers* Oct. to Dec. **DISTRIB.** Throughout the W. Peninsula and in Ceylon. This plant is much valued by the natives of India as a febrifuge. The juice of the leaves forms the chief ingredient of a much used native medicine known as *alun*.

2. *A. echioides*, Nees in Wall. Pl. As. Rar. iii. 117; Royle Ill. 298; F. B. I. iv, 505; Prain Beng. Pl. 309; Cooke Fl. Bomb. ii, 374. *Justicia echioides*, Linn.; Roxb. Fl. Ind. i, 118.

An erect annual, 6-18 in. high. *Stem* 4-angled, grooved, clothed with spreading hairs, sometimes branched. *Leaves* 1-3 in. long, sessile, oblong or subelliptic, obtuse, sparsely hairy, base cuneate, margins ciliate, main lateral nerves 4-6 pairs. *Flowers* unilateral, in axillary spreading or recurved racemes shorter than the leaves, rhachis gland-hairy; bracts  $\frac{1}{2}$  in. long, lanceolate, bracteoles much smaller. *Calyx*  $\frac{3}{4}$  in.; segments narrowly linear, acute, ciliate, elongating in fruit. *Corolla* about  $\frac{1}{2}$  in. long, densely hairy outside, pink or white, the lower lip spotted with purple. *Filaments* slightly hairy, anthers bearded. *Capsule*  $\frac{1}{2}$  in. long, elliptic-lanceolate, hairy. *Seeds*  $\frac{1}{10}$  in. long, rugose, glabrous.

Dehra Dun and Siwalik Range, but chiefly in the western and southern portions of the area. *Flowers* Aug.-Dec. **DISTRIB.** Throughout the drier parts of Tr. p. India from the Punjab Plain and Chota Nagpur to S. India and Ceylon.

## 16. *HAPLANTHUS*, Nees; Fl. Brit. Ind. iv, 506.

Erect herbs. *Leaves* entire. *Flowers* axillary, in false whorls, surrounded by numerous spine-like barren branches (cladodes) which latter are terminated by 2 or 3 minute acicular teeth (reduced leaves); bracts and bracteoles small. *Calyx* 5-partite; segments linear-lanceolate, subequal. *Corolla* small, tubular; limb 2-lipped, upper lip 2-fid., lower obtusely 3-lobed. *Stamens* 2, shorter than the corolla, inserted below the throat, filaments flattened; anthers 2-celled, connivent and subcoherent; cells ovate, more or less unequal, muticous



connective bearded on the back. *Ovary* 6-16-ovulate, style acute or obliquely truncate at the apex. *Fruit* a linear-oblong capsule, compressed at right angles to the septum. *Seeds* from the base of the capsule, oblong-ellipsoid, hardly compressed, appearing densely hairy when moistened.—Species 3, confined to India.

Bracteoles longer than calyx, cladodes more than

1 in. long, capsule glabrous . . . . . 1. *H. verticillaris*.

Bracteoles shorter than calyx, cladodes less

than 1 in. long, capsule hairy . . . . . 2. *H. tentaculatus*.

1. *H. verticillaris*, Nees in DC. *Prod.* xi 513; *F. B. I.* iv, 506; *Cooke Fl. Bomb.* ii, 375. *Justicia verticillata*, Roxb. *Fl. Ind.* i, 135.

A herb,  $1\frac{1}{2}$ -2 $\frac{1}{2}$  ft. high. *Stem* glabrous at the base, more or less pubescent upwards. *Leaves*  $2\frac{1}{2}$ -4 in. long, ovate, acuminate acute or subobtusate, hairy on the upper surface and on the nerves beneath, abruptly cuneate at the base; main nerves 8-10 pairs, prominent beneath, petioles 1-2 in. long. *Cladodes* (axillary spines) 1-1 $\frac{1}{2}$  in. long, stout, 4-angled, enlarging in fruit, usually with 2 sharp spines at the apex, more or less glandular-pubescent and with spreading bristles towards the base. *Flowers* sessile amongst the verticils of cladodes; bracteoles longer than the calyx, subulate, finely pointed. *Calyx*  $\frac{1}{3}$  in. long, segments lanceolate, pointed, gland-pubescent. *Corolla*  $\frac{2}{3}$  in. long, minutely hairy outside, limb lilac with darker lines. *Capsule* about  $\frac{1}{2}$  in. long, narrowly oblong acute, glabrous. *Seeds*  $\frac{1}{16}$ - $\frac{1}{8}$  in. long.

Bundelkhand (Duthie), Ajmer (Lowrie). *Flowers* Dec. and Jan: *DISTRIB.* From Mt Abu in Rajputana and southwards to W. and S. India, also in Assam (Griffith).

2. *H. tentaculatus*, Nees in DC. *Prod.* xi, 513; *F. B. I.* iv, 507; *Cooke Fl. Bomb.* ii 376.

A slender gland-pubescent herb. *Stems* 4-angular above. *Leaves* 2-4 in. long, ovate, acuminate, decurrent into the petioles; main nerves 8-10 pairs, petioles often obscure. *Cladodes* slender,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, densely clothed with short hairs intermixed with longer ones, the apex furnished with 2 or 3 flattened villous teeth (reduced leaves). *Flowers* sessile amongst the cladodes; bracteoles subulate, shorter than the calyx. *Calyx*  $\frac{1}{2}$  in. long; segments linear-subulate, hairy. *Corolla* about  $\frac{1}{2}$  in. long, blue lilac or white. *Capsule*  $\frac{1}{2}$  in. long, oblong, pointed, hairy. *Seeds* smaller than those of *H. verticillaris*.

Found by Edgeworth in C. India at Mandu in the Dhár State, and just within the southern boundary of this flora. *DISTRIB.* Gujarat, Deccan and Konkan.

# 17. PHLOGACANTHUS, Nees; *Fl. Brit. Ind.* iv, 510.

Shrubs or tall herbs. *Leaves* entire or obscurely crenate. *Flowers* in terminal thyrses or narrow panicles, rarely in axillary racemes or cymes; bracts small, bracteoles none. *Calyx* 5-partite, segments very

narrow. *Corolla* tubular, curved upwards, tube narrowly funnel-shaped, limb more or less 2-lipped; lobes ovate or oblong, connivent, spreading or recurved, imbricate in bud. *Stamens* 2, with sometimes 2 small rudiments added; anthers 2-celled, oblong, mucous, glabrous. *Ovary* with 5-8 ovules in each cell, glabrous, style filiform, stigma subsimple. *Fruit* an elongated many-seeded capsule, somewhat 4-angled. *Seeds* from the base of the capsule, lenticular, ovate in outline, glabrous or densely puberulous.—Species about 12, Himalayan, also in Burma and Malaya.

**P. thyrsiflorus**, Nees in Wall. Pl. As. Rar. iii, 99; Royle Ill. 298; F. B. I. iv, 512; Watt E. D.; Kanjilal For. Fl. 260; Gamble Man. Ind. Timb. 523; Brand. Ind. Trees 501. *Justicia thyrsiflora*, Roxb. Fl. Ind. i, 114.

An evergreen shrub, up to 8 ft. high, with smooth grey bark; shoots swollen at the nodes, often tinged with dull purple, 4-angled. *Leaves* drooping, 6-8 in. long, elliptic-lanceolate, obtuse, subentire, dark green and glossy above, paler beneath and densely punctulate, petioles  $\frac{1}{2}$  to 1 in. long. *Flowers* pedicelled, crowded in verticils of four, forming terminal elongate thyrsoid panicles up to 12 in. long; bracts subulate, conspicuous in bud,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, arranged in threes, the 2 inner ones persistent; the outer larger, caducous. *Calyx-segments*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, bristle-like, hairy. *Corolla* orange-coloured or brick-red, villous, tube laterally compressed; upper lip suberect, deeply emarginate; lower spreading, of 3 ovate acute lobes. *Anthers* dark-brown pollen white. *Capsule*  $1\frac{1}{2}$  in. long, linear-clavate, glabrous. *Seeds* 12-14, densely hairy.

Common in moist shady places in the forests of Dehra Dun and Saharanpur, also on the Siwalik Range and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Ondh. Flowers Mar. and Apr. **DISTRIB.** Subtrop. Himalaya up to 4,000 ft. from the Ravi to Bhutan, also in Assam, Chota Nagpur and extending to Upper and Lower Burma.

## 18. **BARLERIA**, Linn.; Fl. Brit. Ind. iv, 482.

Small shrubs or undershrubs, spinous or unarmed. *Leaves* opposite, entire. *Flowers* showy, sessile, solitary or in dense or rather lax spikes or racemes, bracts and bracteoles large, small or none. *Calyx* deeply 4-partite; segments in opposite pairs, outer pair much larger. *Corolla* funnel-shaped, tube elongate; lobes 5, subequal, ovate or elliptic, imbricate in bud. *Stamens* 2, fertile, with oblong 2-celled anthers; 2 small rudimentary stamens sometimes containing a little pollen are also usually present, with often a rudimentary 5th stamen. *Disk* large, often as a toothed cup half enclosing the ovary. *Ovary* with 2 ovules in each cell, style long, stigma bifid or subentire. *Fruit* an ovoid or oblong capsule, 2 or 4-seeded below the middle. *Seeds*

compressed, ovate, clothed with wavy silky closely appressed hairs.—Species about 120, mostly in Trop. Asia and Africa, a few in Trop. America.

Prickly shrubs or undershrubs:—

Outer calyx-segments ending in a spine, capsule 2-seeded . . . . . 1. *B. Prionitis*.

Outer calyx-segments mucronate, not spine-tipped; capsule 4-seeded . . . . . 2. *B. acanthoides*.

Unarmed shrubs or undershrubs:—

Outer calyx-segments subspinescently toothed on the margin, capsule 4-seeded . . . . . 3. *B. cristata*.

Outer calyx-segments strigose with denticulate and ciliate margins, capsule 4-seeded . . . . . 4. *B. strigosa*.

1. *B. Prionitis*, Linn. *Sp. Pl.* 636; *F. B. I.* iv, 482; *Watt E. D.*; *Gamble Man. Ind. Timb.* 522; *Prairie Beng. Pl.* 812; *Cooke Fl. Bomb.* ii, 379. *Barleria Hystrix*, Linn.; *Royle Ill.* 298.

A bush, 2-5 ft high, usually very prickly. Stems and branches terete or obscurely 4 angled, glabrous, bark white. Leaves petioled, about 4 in. long, elliptic, acuminate and tipped with a bristle, lineolate, glabrous or more or less pubescent beneath, tapering at the base, lower leaves distinctly petioled, main lateral nerves about 5 pairs, interpetiolar spines  $\frac{1}{4}$ – $\frac{1}{2}$  in. long. Flowers in terminal spikes, the lower ones often distant; bracts leaf-like, about  $\frac{1}{2}$  in. long, oblong or oblong-lanceolate, acute and ending in a bristle, glabrous; bracteoles  $\frac{1}{2}$  in. long, narrower and almost spine-tipped. Calyx divided nearly to the base; 2 outer segments about  $\frac{1}{2}$  in. long, oblong-lanceolate, spine-tipped; the 2 inner shorter, linear-lanceolate, mucronate. Corolla orange-yellow or cream-coloured, somewhat 2-lipped,  $1\frac{1}{4}$ – $1\frac{3}{4}$  in. long, sparingly hairy outside; upper lip with 4 nearly equal rounded lobes, lower lip rather shorter, tube about as long as the upper lip. Capsule  $\frac{1}{4}$ –1 in. long, with a tapering solid beak, 2-seeded. Seeds  $\frac{1}{2}$  in. in diam.

Common within the area, and often used as a hedge-plant. Flowers Oct.-Jan. **DISTRIB.** Throughout the hotter parts of India, also in Ceylon, Burma and the Malay Peninsula, extending to Trop. and S. Africa. The juice of the leaves and the roots are used medicinally by the natives in some parts of India.

2. *B. acanthoides*, Vahl *Symb.* i, 47; *F. B. I.* iv, 484; *Cooke Fl. Bomb.* ii, 381.

A small prickly much-branched undershrub; branches terete, hoary-pubescent. Leaves sessile or shortly petioled, hairy, dark-green,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. long, oblong or obovate, obtuse, mucronate, tapering to the base, main lateral nerves 5 pairs. Inflorescence of dense unilateral racemes or reduced to a solitary flower; bracts  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, spinopointed, sometimes spinous-pinnatifid or reduced to pinnatifid spines

*Calyx-segments* glabrate, strongly nerved and soon becoming scarious; outer pair  $\frac{1}{2}$  in. long; broadly ovate, acute, mucronate; inner pair smaller, lanceolate. *Corolla* white, hairy outside,  $2\frac{1}{2}$ -3 $\frac{1}{2}$  in. long; tube cylindric, dilated just below the limb; lobes ovate,  $\frac{1}{2}$  in. long. *Capsule* ellipsoid, glabrous, 4-seeded. *Seed*  $\frac{1}{2}$  in. long, silky-hairy.

Dry hills in Merwāra (Duthia) (Oct. to Jan.). **DISTRIB.** Punjab, Rajputana, Sind; extending to Baluchistan, Abyssinia, Nubia and Egypt.

3. *B. cristata*, Linn. *Sp. Pl.* 636; Roxb. *Fl. Ind.* iii, 37; Royle *Ill.* 298; F. B. I. iv, 488; Watt *E. D.*; Kanjilal *For. Fl.* 262; Gamble *Man. Ind. Timb.* 522; Collett *Fl. Siml.* 374; Prain *Beng. Pl.* 812; Cooke *Fl. Bomb.* ii, 382. *B. dichotoma* and *B. ciliata*, Roxb. l. c. 38.

A small erect or diffuse undershrub, the branches clothed with appressed yellowish hairs, the nodes densely hairy. *Leaves*  $2\frac{1}{2}$ -4 in. long, elliptic-oblong, acute, tapering towards the base, hairy on both surfaces, lineolate above, petioles  $\frac{1}{2}$ -1 in. long. *Flowers* in axillary and terminal ovate spikes; bracteoles conspicuous, about  $\frac{1}{2}$  in., linear, acute, membranous and prominently veined; margins ciliate, sometimes with distant teeth. *Calyx* hairy below; segments  $\frac{3}{4}$ -1 in. long, whitish, prominently veined and reflexed, the 2 outer segments lanceolate, acuminate, mucronate, marginal teeth bristle-tipped; inner segments  $\frac{1}{2}$  in. long, linear-lanceolate, acute. *Corolla* blue purple or white, 1-1 $\frac{1}{2}$  in. long, hairy outside, tube funnel-shaped in the upper half; lobes  $\frac{1}{2}$  in., obovate-oblong. *Capsule*  $\frac{3}{4}$  in. long, ellipsoid, 4-seeded. *Seed* orbicular, covered with silky hairs.

Found chiefly in the northern portion of the area from Dehra Dun eastwards along the Sub-Himalayan tracts of Rohilkhand and W. Oudh and in the district of Gorakhpur. It has been reported also from Bundelkhand (Edgeworth) and Alwarā (Duthia). Owing to its ornamental appearance it is largely grown in gardens. In the plains it flowers mostly during the cold season. **DISTRIB.** Himalaya up to 6,000 ft. in Garhwal and Kumaon, also in Bengal, Khasia and Burma and in the hilly parts of W., C. and S. India. It is cultivated in gardens in various parts of India and in other countries. Various parts of this plant are used medicinally, and by some natives the seeds are regarded as an antidote for snake-bites. Roxburgh's *B. dichotoma* has white flowers. It is cultivated in gardens, and is sometimes found planted near Hindu temples. It is mentioned by Prain and Cooke as a variety of *B. cristata*. There is no record of its having been met with in a wild state within the area of this flora.

4. *B. strigosa*, Willd. *Sp. Pl.* iii, 379; F. B. I. iv, 489; Watt *E. D.*; Kanjilal *For. Fl.* 262; Gamble *Man. Ind. Timb.* 522; Prain *Beng. Pl.* 812; Cooke *Fl. Bomb.* ii, 384 (under var. *terminalis*); Brandis *Ind. Trees* 498. *B. cœrulea*, Roxb.; *Fl. Ind.* iii, 39.

An unarmed shrub, 3-4 ft. high. Stems more or less strigose with fulvous hairs. *Leaves*  $4\frac{1}{2}$ -6 in. long, ovate or elliptic, acute or acuminate, the base long-decurrent on the petiole, lineolate and sparingly fulvous

strigose on the upper surface, densely strigose on the nerves and veins beneath and with bulbous-based hairs intermixed, margins ciliate main lateral nerves 6-8 pairs. *Flowers* in dense fulvous-hairy unilate ral spikes, often crowded at the tops of the branches; bracteoles about  $\frac{1}{2}$  in. long, lanceolate, hairy on the back and with ciliate margins. *Calyx* densely strigose; outer segments subequal,  $\frac{3}{4}$ -1 in. long, elliptic-lanceolate, sub-acute, margins denticulate and ciliate; inner smaller, linear, acute, densely clothed with white appressed silky hairs. *Corolla*  $1\frac{1}{2}$ -2 in. long, blue; tube pale-blue, upper part funnel-shaped; lobes obovate-oblong, obtuse. *Capsule*  $\frac{3}{4}$  in. long, acute at the top, 4-seeded, glabrous. *Seeds* silky-hairy.

Plentiful in Dehra Dun, on the Siwalik Range and in the Sub-Himalayan tracts eastwards. *Flowers* during the cold season. *DISTRIB.* Bengal, Assam and Sikkim, extending to Burma; also in the Bombay Pres. and S. India. Cultivated in gardens. The root is used by the Santals as a remedy for coughs.

### 19. ASYSTASIA, Blume; Fl. Brit. Ind. iv, 492.

Herbs or undershrubs. *Leaves* entire. *Flowers* in lax or dense usually 1-sided simple or compound spikes or racemes; bracts and bracteoles linear, usually shorter than the calyx. *Calyx* deeply 5-partite; segments equal, linear or linear-lanceolate. *Corolla-tube* inflated above; lobes 5, subequal, imbricate in bud. *Stamens* didynamous, all perfect; anthers oblong, cells parallel, approximate, minutely spurred at the base or submuticous. *Ovary* with 2 ovules in each cell; style linear, very hairy, stigma minutely bifid or subcapitate. *Fruit* an elliptic-clavate capsule, its base contracted and solid. *Seeds* 4, compressed suborbicular or irregularly angled, rugose or tuberculate, glabrous.—Species about 34, in tropical regions of the Old World.

*A. macrocarpa*, Nees in Wall. Pl. As. Rar. iii, 89; F. B. I. iv, 495 Prain Beng. Pl. 813.

A diffuse rambling hairy undershrub. *Stems* 1-4 ft., obtusely 4-gonous. *Leaves* about  $4\frac{1}{2}$  in. long, petioled, oblong or lanceolate, narrowed at both ends, hairy on both sides, margins subrepand, main lateral nerves 8 pairs, petioles  $\frac{1}{2}$  in. long. *Racemes* usually condensed and 1-sided; sometimes 3-4 in. long, erect, somewhat lax and with the lower flowers opposite, lower pedicels up to  $\frac{1}{4}$  in. long, bracts  $\frac{1}{2}$  in. long. *Calyx-segments*  $\frac{1}{4}$  in. long, linear-lanceolate, pubescent. *Corolla*  $1\frac{1}{4}$  in. long, dull-pink, pubescent, cylindric base of tube much shorter than the ventricose portion. *Anther-cells* distinctly spurred at the base. *Capsule*  $1\frac{1}{2}$  in. long, pubescent, its solid base  $\frac{3}{4}$  in. long. *Seeds*  $\frac{1}{4}$  in. in diam., tubercled and rugose.

Dehra Dun (Gamble). *DISTRIB.* W. Himalaya up to 4,000 ft. in Kumaon, also in N. Bengal.

## 20. LEPIDAGATHIS, Willd.; Fl. Brit. Ind. iv, 515.

Herbs or undershrubs, often pubescent. *Leaves* entire or crenate-serrate. *Flowers* sessile, usually capitate, sometimes opposite or solitary; heads terminal or axillary, almost always dense, often 1-sided, sometimes fascicled; bracts usually conspicuous, bracteoles smaller. *Calyx* deeply 5-lobed; segments unequal, the 2 anterior often more or less connate, the calyx becoming almost 4-partite. *Corolla* usually small, 2-lipped; tube slender below, suddenly swollen at or above the middle; upper lip erecto-patent, usually notched or 2-fid., lower lip with 3 spreading usually notched lobes. *Stamens* didynamous, included; anthers all 2-celled; cells oblong, mucous, frequently bearded, one of them often attached higher up than the other. *Pist.* annular. *Ovary* with 2 ovules (rarely 1) in each cell, style recurved, stigma capitate, shortly 2-lobed or entire. *Fruit* a compressed ovoid-oblong baccate capsule. *Seeds* 2 or 4, compressed, ovate-oblong or orbicular, hairy.—Species about 80, in the warmer regions of the world, but in America two only are known.

Capsule 2-seeded, bursting irregularly, seeds clothed with long hairs:—

- |                                      |                             |
|--------------------------------------|-----------------------------|
| Calyx-lobes spinescent . . . . .     | 1. <i>L. Hamiltoniana</i> . |
| Calyx-lobes not spinescent . . . . . | 2. <i>L. trinervis</i> .    |

Capsule 4-seeded, distinctly 2-valved, seeds clothed with short hairs:—

- |  |                          |
|--|--------------------------|
| An erect undershrub, bracts and calyx-segments glandular-hairy . . . . . | 3. <i>L. cuspidata</i> . |
|--|--------------------------|

Diffuse or prostrate herbs, rarely sub-erect:—

- |                              |                              |
|------------------------------|------------------------------|
| Bracts striate . . . . .     | 4. <i>L. purpuricaulis</i> . |
| Bracts not striate . . . . . | 5. <i>L. hyalina</i> .       |

1. *L. Hamiltoniana*, Wall. Pl. As. Rar. iii, 96; F. B. I. iv, 516; Watt E. D. (under *L. cristata* var. *rupestris*); Prain Beng. Pl. 815.

A perennial herb. *Stems* elongate, flagelliform, leafy upwards. *Leaves* 5-6 in. long, linear or narrowly oblong, subfalcate, nearly glabrous, margins scabrous. *Spikes* in globular heads, arising from the base of the stems; bracts up to  $\frac{1}{2}$  in. long, lanceolate, acuminate, spinescent, margins ciliate with long white spreading hairs. *Calyx-segments* membranous, tough, lanceolate, acuminate, spinescent, not thickened upwards, the lower one broader and bifid. *Corolla* strigose outside with white hairs, spotted with brown inside. *Capsule* 2-seeded, conical, scarious on the back, thin and irregularly rupturing. *Seeds* ovate, covered with long hairs.

Found usually in dry situations as in the Jumna ravines near Etawah and Agra; also in Bundelkhand, Ajmer and in the Gonda district of N. Oudh. Flowers during the cold season. **DISTRIB.** Behar, Chota Nagpur and southwards to Chanda in the C. Provinces.

**2. *L. trinervis***, Nees in Wall. Pl. As. Rar. iii, 96; F. B. I. iv, 517; Prain Beng. Pl. 815; Cooke Fl. Bomb. ii, 393.—Vern. Pattar-phor (Merwara).

A diffuse perennial herb, woody below; branches many, 5-10 in. long, slender, 4-angled. *Leaves* sessile, 1-1½ in. long, linear, subacute, entire, nearly glabrous, 3-nerved from a tapering base, margins scabrous. *Flowers* in axillary ovoid spikes ½-¾ in. long, usually 2 or more spikes closely packed together and forming what appears to be a single head; bracts under ½ in. long, ovate or obovate, tipped with a long recurved spine; bracteoles as long as the bracts, oblong-lanceolate, aristate, softly membranous. *Calyx* membranous, ⅓ in. long; 3 outer segments nearly equal in length, lanceolate, acute, not spine-pointed, nearly glabrous outside, very hairy within; the 2 inner lateral segments shorter and narrower, hairy on both sides. *Corolla* white with yellow brown or purple spots, ¼-½ in. long. *Capsule* 2-seeded, ¼ in. long, ovoid-lanceolate, subacute, thin and bursting irregularly. *Seeds* covered with long hairs.

Frequent in Merwara in dry rocky or sandy ground. Flowers in the cold season. **DISTRIB.** N.-W. Himalaya? (Herb. Falconer), Chota Nagpur and at the base of the Sikkim Hills, extending to Central W. and S. India.

**3. *L. cuspidata***, Nees in Wall. Pl. As. Rar. iii, 97; F. B. I. iv, 519; Cooke Fl. Bomb. ii, 396.

An erect undershrub. *Stems* 1-3 ft. high; branches 4 angled, often gland-pubescent upwards. *Leaves* of main stem 3-4½ in. long, oblong-lanceolate, acute or acuminate, usually mucronate, glabrous or nearly so, tapering at the base and decurrent into the petiole; leaves of the branches subsessile and much smaller, elliptic-lanceolate, spinous pointed, softly hairy. *Spikes* terminal or terminating short axillary branches, varying in length according as the flowers are densely or loosely arranged, and if the latter, the flowers are distinctly in opposite pairs; bracts about ½ in. long, elliptic or obovate, acute, spine-tipped, 3-5-nerved, gland-hairy; bracteoles smaller, 1-3-nerved. *Calyx* about ½ in. long, glandular-hairy; outer segments longer, broader than the inner, spine-tipped; the 2 inner lateral segments linear acute. *Corolla* white streaked with purple; upper lip ovate, acute; lower lip with rounded lobes, palate glabrous. *Capsule* 4-seeded, ½ in. long, ovoid-lanceolate, acute, glabrous. *Seeds* clothed with short hairs, especially along the margins.

Dehra Dun and Siwalik Range, Hardwar (Wallich), and along the Sub-Himalayan tracts eastwards to Gonda and the Nepal Terai. Flowers March-May. **DISTRIB.** W. Himalaya up to 5,000 ft. in Kumaon, extending to C. and W. India.

## 21. ECBOLIUM, Kurz.; Fl. Brit. Ind. iv, 544.

Glabrous or hairy shrubs. *Leaves* entire. *Flowers* in dense terminal spikes; bracts large, imbricate; bracteoles small, linear or lanceolate. *Calyx* 5-partite, segments linear. *Corolla* 2-lipped; tube (in the Indian species) long, linear; upper lip entire or 2-fid., 3-lobed. *Stamens* 2, staminodes none; anthers 2-celled; cells parallel, subequal, not spurred at the base. *Ovary* glabrous or hairy, ovules 2 in each cell, style filiform, stigma shortly 2-fid. *Fruit* an ovoid compressed capsule, with a solid stalk, usually 2-seeded, placentas not rising elastically from the base of the valves, *Seeds* (in the Indian species) large, ovoid or orbicular, compressed, tubercular-scabrous, not hairy.—Species 12, one in India, the rest in Africa, Madagascar and Arabia.

This genus is distinguished from *Justicia* by having the anther-cells at about the same level; and its alliance with that genus is through *J. Adhatoda*, in which the anther-cells are not spurred.

**E. Linneanum** Kurz, VAR *dentata*, C. B. Clarke in *F. B. I.* iv, 545; *Prair. Beng. Pl.* 816. *Justicia* *Ecbolium*, Linn.; *Roxb. Fl. Ind.* i, 114.

A small glabrescent undershrub. *Stems* swollen above the nodes. *Leaves* up to 6 in. long, ovate or lanceolate, acute or subobtuse, tapering at the base into a short petiole, dark-green above, paler beneath. *Spikes* dense, 2-6 in. long; bracts about  $\frac{3}{4}$  in. long, obovate-rhomboid acute or subacuminate, pubescent or puberulous, pale-green; margin more or less toothed, ciliate. *Calyx-segments*  $\frac{1}{4}$  in. long, linear-lanceolate, acute. *Corolla* bluish-green, hairy outside. *Capsule*  $\frac{3}{4}$ -1 in. long puberulous; seed bearing portion broad, acute at the apex; stalk  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, solid.

Gorakhpur district, in the fire-exposed tracts (Duthie). Flowers in March and April. **DISTRIB.** E. Bengal and Assam, extending to Trop. Africa and Madagascar. The Gorakhpur specimens, owing to local conditions are considerably dwarfed, and the main roots are developed into hard fusiform tubers similar to those of *Ruellia suffruticosa* and of other perennial plants inhabiting fire-exposed ground.

## 22. JUSTICIA, Linn.; Fl. Brit. Ind. iv, 524.

Herbs or shrubs. *Leaves* opposite, entire. *Flowers* sessile or nearly so, in spikes or panicles, rarely solitary; bracts usually small; bracteoles narrow, obsolete or none. *Calyx* 5- or 4-partite, segment narrow. *Corolla* 2-lipped, tube equalling or shorter than the limb upper lip 2-lobed or subentire; lower 3-lobed, lobes imbricate in bud. *Stamens* 2, attached to the upper part of the corolla-tube;



nerves 8-12 pairs, veins reticulate, petioles  $\frac{1}{2}$ -1 in. long. Flowers in short dense axillary peduncled spikes 1-3 in. long, arranged towards the ends of the branches; peduncles stout, shorter than the leaves; bracts up to  $\frac{2}{3}$  in. long, elliptic, subacute, glabrous or nearly so, 5-7-nerved, closely reticulate; bracteoles  $\frac{2}{3}$  in. long, 1-nerved, margins ciliate. Calyx  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, often slightly pubescent; segments equal, oblong-lanceolate, acute, 3-nerved. Corolla white with pink or purple stripes in the throat,  $1\frac{1}{2}$  in. long, hairy outside; tube  $\frac{1}{2}$  in. long, upper half much inflated laterally; upper lip curved, ovate-oblong, notched; lower lip as long as the upper; lobes oblong, rounded. Filaments hairy at the base, the lower anther-cells apiculate (not spurred) at the base. Ovary and lower portion of style hairy. Capsule  $\frac{2}{3}$  in. or more in length, clavate, pubescent. Seeds suborbicular, tubercular-verrucose.

Abundant in all parts of the area, especially in Dehra Dun and throughout the Sub-Himalayan tracts eastwards. It is often cultivated near villages, and sometimes in the form of hedges. Flowers chiefly after the rainy season. DISTRIB. Throughout India and in Ceylon, ascending to 4,500 ft. on the Himalaya; it is found also in Burma and in the Malay Peninsula and Archipelago. All parts of the plant have a bitter taste and possess pronounced medicinal properties, and this may account for the fact of its not being eaten by goats. The charcoal prepared from the wood is used for making gunpowder, and in Bengal the wood is sometimes manufactured into beads. The leaves yield a yellow dye; they are also much used in some parts of India as a manure, with the idea of ridding the ground of noxious insects; but, apart from this, the leaves containing as they do, a large amount of potassium nitrate must add considerably to the fertility of the soil. The absence of a spur at the base of the lower-anther-cells connects this species with the genus *Ecbolium*.

2. *J. Betonica*, Linn. Sp. Pl. 15, VAR. *ramosissima*. F. B. I. iv, 525; Prain Beng. Pl. 817; Cooke Fl. Boml. ii, 407. *J. ramosissima*, Roxb. Fl. Ind. i, 129. *Adhatoda ramosissima*, Nees.

A diffusely branched undershrub; branches more or less decumbent and often rooting at the lower nodes, cylindric, often tinged with purple above the nodes, slightly pubescent when young. Leaves 2-4 in. long, ovate or lanceolate, subobtuse, entire or slightly toothed, glabrous pale green, petioles up to  $\frac{1}{4}$  in. long. Spikes 1-5 in. long, usually terminal, simple or branched; bracts white veined with green, about  $\frac{1}{2}$  in. long, lanceolate, acute, glabrous; bracteoles narrower, unequal at the base, glabrous except the ciliolate margins. Calyx deeply 5-partite,  $\frac{1}{2}$  in. long, pubescent; segments linear-lanceolate, acute. Corolla dull-white, veined and spotted with pink. Filaments hairy at the base, lower cells of anthers acutely spurred. Capsule  $\frac{2}{3}$  in. long, widely clavate at the top and protuberant above the seeds. Seeds 4, nearly spherical, intensely rugose.

Widely distributed within the area. DISTRIB. Throughout the warmer parts of India. This differs from the type by its more bushy habit, and

its spreading decumbent branches often strike root at the nodes ; also the bracts are narrower and less conspicuously white.

**VAR. villosa**, *F. B. I.* iv, 525 ; *Prain Beng. Pl.* 817.—An erect shrub with softly hairy stems. *Leaves* densely hairy beneath. *Flowers* salmon-coloured.—Found in the southern portion of the area. **DISTRIB.** Common in Chota Nagpur and in Central India.

**3. J. quinquangularis**, *Koen. ex Roxb. Hort. Beng.* 80 ; *Fl. Ind.* i, 133 ; *F. B. I.* iv, 536 ; *Prain Beng. Pl.* 818 ; *Cooke Fl. Bomb.* ii, 411.

A slender glabrous somewhat prostrate herb. *Stems* often reaching 2 in., angular, geniculate and with distant internodes. *Leaves* shortly stalked, 1-3 in. long, linear or linear-lanceolate, obscurely lineolate, glabrous. *Spikes* 1-5 in. long, terminal, slender, glabrous ; bracts  $\frac{1}{2}$  in. long, linear, obtuse, glabrous, the margins as also of the bracteoles and calyx-segments scarious ; bracteoles similar to the bracts, but narrower. *Calyx* as long as the bracts, 4-partite ; segments linear, obtuse. *Corolla* rose-coloured,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, glabrous or slightly hairy outside ; upper lip  $\frac{1}{2}$  in. long, notched ; lower lip rather longer, suborbicular, shortly 3-lobed. *Filaments* glabrous. *Ovary* glabrous. *Capsule*  $\frac{1}{2}$  in. long, oblong, pointed, tapering to the base, glabrous. *Seeds* 4, reticulately rugose.

Abundant throughout the Upper Gangetic Plain. **DISTRIB.** From the plains of the Punjab and Bengal southwards to C. and S. India.

**VAR. peploides**, *F. B. I.* iv, 537 ; *Prain Beng. Pl.* 818 ; *Cooke Fl. Bomb.* ii, 411.—A prostrate herb, usually more branched than the type, *Leaves* oblong or elliptic-oblong, petioles up to  $\frac{3}{8}$  in. long. *Spikes* shorter and broader. Common within the area. **DISTRIB.** Plains of Punjab and Bengal and southwards to C. and W. India, extending to Afghanistan.

**4. J. diffusa**, *Willd. Sp. Pl.* i, 87 ; *F. B. I.* iv, 538 ; *Prain Beng. Pl.* 818 ; *Cooke Fl. Bomb.* ii, 410. *J. procumbens*, *Linn. (in part)* ; *Roxb. Fl. Ind.* i, 132.

A diffuse much-branched herb. *Stems* somewhat 4-angled, 1-2 ft. high slightly woody below. *Leaves* 1-2 in. long, ovate or elliptic-lanceolate, acute or acuminate, lineolate on both sides, glabrous or nearly so, base acute, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* in slender axillary and terminal spikes 1-6 in. long ; bracts linear-lanceolate or linear, shorter than the calyx, ovate, acuminate, margins scarious, tips minutely scabrous ; bracteoles similar to the bracts, but narrower. *Calyx*  $\frac{1}{2}$  in. long, 4-partite nearly to the base ; segments unequal, lanceolate, acute, minutely scabrous upwards. *Corolla*  $\frac{1}{2}$  in. long, pink or pale-purple, slightly hairy outside. *Filaments* hairy at the base. *Ovary* glabrous, style hairy below. *Capsule*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, oblong, shortly pointed, glabrous. *Seeds* obscurely rugose.

Abundant within the area. **DISTRIB.** Plains of the Punjab, Sind and Bengal extending to S. India and Ceylon, also in Burma and Siam.

**5. J. simplex**, D. Don. *Prod.* 118; *F. B. I. iv*, 539; Collett *Fl. Siml.* 375; Prain *Beng. Pl.* 818; Cooke *Fl. Bomb. ii*, 411.

A slender erect or prostrate herb. *Stems* 6-20 in.; branches 4-angular, more or less hairy. *Leaves* petioled, 1-2 in. long, ovate or elliptic-oblong, obtuse, glabrous or hairy, strongly lineolate. *Flowers* in dense axillary and terminal spikes 1-4 in. long; bracts about as long as the calyx, elliptic, subacute, hairy; margins scarious, ciliate with jointed hairs; bracteoles similar, but narrower. *Calyx*  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, deeply partite; segments unequal in length, linear, subacute; margins scarious, densely ciliate. *Corolla* pale-purple,  $\frac{1}{2}$ - $\frac{1}{2}$  in.; hairy outside, tube equalling the limb. *Filaments* hairy at their insertion. *Ovary* at the apex and base of style hairy. *Capsule*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, oblong, obtuse, hairy at the top. *Seeds* rugose.

Common within the area of this flora. *Flowers* during the cold season. **DISTRIB.** W. Himalaya from Kashmir to Kumaon up to 7,000 ft. also from the Punjab plain, Sind and Bengal to Central and W. India, extending to Abyssinia, the Malay Archipelago and the Loochoo Inlands.

**J. GENDARUSSA**, *Burm.*; Roxb. *Fl. Ind. i*, 128; *F. B. I. iv*, 532; Watt *E. D.*; Prain *Beng. Pl.* 818; Cooke *Fl. Bomb. ii*, 412. —Vern. Jagat madan.—A small erect evergreen shrub, tinged with purple and strongly scented. *Leaves* lanceolate, glabrous. *Flowers* in interrupted spikes. *Corolla* white or pink with purple spots. Common in gardens within the area and in other parts of India and in Ceylon. It is often met with as an escape. Probably introduced from China.

## 23. PERISTROPHE, Nees; *Fl. Brit. Ind. iv*, 554.

Erect spreading herbs. *Leaves* entire. *Flowers* purple or rose-coloured, in axillary or terminal clusters, often panicled by the reduction of the floral leaves; bracts 1-4 together, linear or ovate, usually longer than the calyx. *Calyx* 5-partite; segments equal, linear-lanceolate. *Corolla* 2-lipped, tube slender, upper lip subentire, lower shortly 3-lobed. *Stamens* 2, filaments pubescent below; anthers 2-celled; cells linear, rarely ovoid, mucicous, one higher up than the other. *Ovary* with 2 ovules in each cell, style filiform, stigma shortly bifid. *Fruit* an ellipsoid stipitate capsule, usually 4-seeded, pubescent; placentas not separating elastically. *Seeds* ovoid, compressed, minutely glandular-papillose.—Species about 20, in the warmer regions of the world.

**P. bicalyculata**, Nees in *Wall. Pl. As. Rar. iii*, 113; *F. B. I. iv*, 554; Watt *E. D.*; Cooke *Fl. Bomb. ii*, 415; *Justicia bicalyculata*, Vahl; Roxb. *Fl. Ind. i*, 126.

An unattractive-looking herb, 3-4 ft. high. *Branches* 6-angled, hairy, the angles more or less scabrous. *Leaves* 2-3 in. long, ovate, acuminate, strongly lineolate, sparsely hairy above, densely so on the nerves and

veins beneath, base rounded, main lateral nerves 4-6 pairs, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* in 3-chotomous cymes forming large lax divaricate hairy panicles; bracts 2, unequal, opposite,  $\frac{1}{4}$ - $\frac{3}{8}$  in. long. linear, acute, mucronate; margins membranous, white; bracteoles 4, smaller. *Calyx*  $\frac{1}{8}$ - $\frac{1}{6}$  in long, segments with ciliate margins. *Corolla* pink,  $\frac{1}{3}$ - $\frac{1}{2}$  in. long, hairy outside; upper lip entire, obtuse; lower rather longer, with 3 acute lobes. *Filaments* hairy. *Capsule*  $\frac{1}{3}$  in. long, pointed, narrowed below into a stalk. *Seeds* papillose, slightly rugose.

A very common plant within the area. **DISTRIB.** Throughout the warmer parts of India, but not in Ceylon; outer Himalayan ranges up to 6,000 ft. in Kumaon; also in Afghanistan and Trop. Africa. The plant is regarded by natives as a remedy for snake-bites.

#### 24. RUNGIA, Nees; Fl. Brit. Ind. iv, 545.

Erect or diffuse herbs or shrubs. *Leaves* entire. *Flowers* in dense terminal or axillary 1-sided spikes; bracts in 2 or 4 rows, two of the rows often flowerless, the flowering bracts often with scarious margins, bracteoles narrower than the bracts. *Calyx* small, 5-partite, segments linear-lanceolate. *Corolla* small, 2-lipped; upper lip acute or emarginate; lower longer, 3-lobed. *Stamens* 2; anthers 2-celled, parallel or often superposed; lower cell, mucous or with a white basal appendage. *Ovary* with 2 ovules in each cell, style filiform, stigma bifid. *Fruit* an ovoid or oblong shortly stalked capsule, placentas and retinacula elastically separating from the base of the capsule after dehiscence. *Seeds* normally 4, compressed, orbicular, glabrous, minutely tuberculate, often concentrically rugose—Species about 30, in the warmer parts of the Old World.

Bracts uniform; corolla white or violet with purple spots, upper lip emarginate . . . . .

1. *R. repens*.

Bracts dimorphic; corolla white with blue lines, not spotted, upper lip entire . . . . .

2. *R. parviflora*  
var. *pectinata*.

1. *R. repens*, Nees in Wall. Pl. As. Rar. iii, 110; F. B. I. iv, 549; Watt h. D.; Prain Beng. Pl. 821; Cooke Fl. Bomb. ii, 401. *Justicia repens*, Roxb. Fl. Ind. i, 152.

*Stems* decumbent and rooting near the base, slender and erect above, glabrous or slightly hairy. *Leaves* nearly sessile, 1-2 in. long, oblong, lanceolate, acute, lineolate on both surfaces, sparsely hairy; base tapering, or sometimes rounded and unequal-sided. *Flowers* in erect terminal pubescent spikes 1-2½ in. long; bracts  $\frac{1}{4}$  in. long, broadly elliptic, cuspidate; margins scarious, ciliate; bracteoles smaller, linear-lanceolate, acute, puberulous, margins scarious. *Calyx*  $\frac{1}{6}$  in. long deeply divided; segments lanceolate-subulate, pubescent. *Corolla*  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, white or violet with purple spots in the throat, hairy outside, upper

lip emarginate. Cells of lower anthers with a white appendage at the base. *Capsule* about  $\frac{1}{2}$  in. long, pubescent, scarious on the faces, edges hard. *Seeds* concentrically rugose.

Abundant within the area. **DISTRIB.** Throughout the warmer parts of India, and in Ceylon. The plant is often used medicinally.

2. *R. parviflora*, Nees in Wall. Pl. As. Rar. iii, 110, VAR. *pectinata*, C. B. Clarke in F. B. I. iv, 550; Watt E. D.; Prain Beng. Pl. 821; Cooke Fl. Bomb. ii, 400. *Justicia pectinata*, Linn.; Roxb. Fl. Ind. i, 133.

A much-branched procumbent annual. *Leaves*  $\frac{1}{2}$ -about  $2\frac{1}{2}$  in. long, elliptic or oblong-lanceolate, acute or subobtusate, glabrous or sparsely hairy, lineolate, base acute, petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in. long. *Flowering spikes*  $\frac{1}{2}$ -1 in. long, often 2 or 3 together at the ends of the branches; bracts dimorphic, the barren ones  $\frac{1}{4}$  in. long, in two rows, lanceolate, cuspidate, pubescent, margins scarious; fertile bracts  $\frac{1}{2}$  in. in diam., orbicular, hairy on both surfaces, margins broadly scarious, usually 2-fid. at the apex; bracteoles smaller than the bracts, elliptic-oblong, subacute, concave, 2-fid., the margins scarious and ciliate. *Calyx*  $\frac{1}{2}$  in. long, linear-lanceolate. *Corolla* white, with blue lines,  $\frac{1}{2}$  in. long, hairy outside; upper lip acuminate, not emarginate. *Anthers* superposed, the lower ones white-tailed. *Capsule*  $\frac{1}{10}$  in. long, ovoid, acute, compressed, hairy at the apex and with scarious faces. *Seeds* minutely echinulate.

A common weed within the area. **DISTRIB.** Throughout the warmer parts of India and in Ceylon, ascending to 4,000 ft. on the Kumaon Himalaya. The roots, leaves and the juice of this plant are used in native medicines.

## 25. DICLIPTERA, Juss.; Fl. Brit. Ind. iv, 550.

Diffuse or sub-erect herbs. *Leaves* ovate or elliptic, acute, entire or obscurely undulate. *Flowers* in axillary and terminal clusters or in paniced cymes, one or more enclosed within a pair of opposite bracts, the flowers sessile within the bracts and often reduced to a calyx and bracteoles; bracts exceeding the calyx; bracteoles linear or linear-lanceolate, about equalling the calyx. *Calyx* 5-partite; segments equal, linear-lanceolate, more or less pubescent. *Corolla* red often spotted with purple, tube slender, limb deeply 2-lipped; upper lip entire or emarginate; lower 3-lobed, recurved. *Stamens* 2, anthers 2-celled; cells ovoid, usually superposed, muticous. *Ovary* with 2 ovules in each cell, style filiform, stigma shortly bifid. *Fruit* a clavate capsule, narrowed below into a solid stalk, placentas separating elastically from the base of the capsule after dehiscence. *Seeds* ovoid or suborbicular, compressed, verrucose echinulate or papillose.—Species about 60, in tropical and sub-tropical regions of both hemispheres.



Himalayan tracts of Rohilkhand and N. Oudh. **DISTRIB.** Himalaya from Kashmir to N. Assam and Chittagong, up to 7,000 ft. ; also on the hills of Rajputana and C. India, extending to Afghanistan.

**RHINACANTHUS COMMUNIS**, *Nees* ; *Royle Ill.* 298 ; *F. B. I.* iv, 541 ; *Watt E. D.* ; *Prain Beng. Pl.* 819 ; *Cooke Fl. Bomb.* ii, 415. *Justicia nasuta*, *Linn.* ; *Roxb. Fl. Ind.* i, 120.—*Vern. Jui-pana*.—An undershrub with oblong or ovate leaves and white flowers arranged in large panicles. —Cultivated within the area of this flora and throughout India. It appears to be wild in the Deccan and also in Ceylon where, according to Trimen, it is not cultivated. It occurs also in Java and in Trop. Africa as an introduced plant. The fresh root and leaves are used by natives as a remedy for certain skin-diseases, and more particularly for what is commonly known as *Dhobi's itch*.

**GRAPTOPHYLLUM HORTENSE**, *Nees* ; *F. B. I.* iv, 545 ; *Cooke Fl. Bomb.* ii, 416. *Justicia picta*, *Linn.* ; *Roxb. Fl. Ind.* i, 117. A glabrous shrub with lanceolate leaves which are often blotched with white, and the flowers are large and crimson.—Cultivated in gardens throughout the hotter parts of India and in most tropical countries. Probably wild in the Malay Archipelago.

## LXXXVI.—VERBENACEÆ.

Herbs, shrubs or trees. *Leaves* opposite or whorled, simple or digitate, very rarely pinnate ; stipules none. *Inflorescence* cymose racemose or spicate ; cymes often compound or paniculate, bracts usually small ; flowers often showy, 2-sexual or polygamous, usually irregular. *Calyx* inferior, gamosepalous, persistent, 5-4 (rarely 6-8)-toothed. *Corolla-tube* cylindric or dilated upwards ; limb 2-lipped or subequal, 5-4 (rarely many)-lobed. *Stamens* didynamous (rarely 2 or very rarely 5 or 6), inserted on corolla-tube. *Disk* usually inconspicuous. *Ovary* superior, 2-4-celled, very rarely 8-celled or almost 1-celled, entire or 4-lobed, style terminal, stigma usually entire ; ovules variously attached, 2 or solitary in each cell. *Fruit* a drupe, rarely capsular, 2-4-or 1-celled, cells 1-seeded. *Seeds* erect or pendulous, albumen (in the Indian genera) none.—Species about 700, chiefly in the tropical regions of both hemispheres.

Flowers in dense spikes, opening centripetally :—

Fruit with two 1-seeded pyrenes, calyx small :—

Fruit indehiscent, succulent. Usually scabrous climbing shrubs . . .

1. LANTANA

didynamous, included, anthers broadly oblong. Ovary 2-celled; with 1 ovule in each cell, style short, stigma oblique, subcapitate. Fruit a more or less fleshy drupe, containing 2 bony 1-celled pyrenes.—Species about 50, in tropical and subtropical regions, mostly American.

*L. indica*, Roxb. Hort. Beng. 46; Fl. Ind. iii, 89; Brandis For. Fl. 369; Ind. Trees 502; F. B. I. iv, 562; Kanjilal For. Fl. 269; Gamble Man. Ind. Timb. 524; Collett Fl. Siml. 379; Prain Beng. Pl. 824; Cooke Fl. Bomb. ii, 418; *L. dubia*, Wall.; Royle Ill 300, t. 73, fig. 2. *L. collina* Dene. in Jacquem. Voy. Bot. 136, t. 141. *L. alba*, Schauer; Brandis For. Fl. 369. — Vern. Ghaneri. *pápar-dani* (Ajmer).

A shrub, 3-8 ft. high; branches roughly hairy, long and straggling, 4 angular, sometimes prickly, yellowish brown. Leaves  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. long, opposite or in whorls of 3, ovate, acute or subobtuse, crenate-serrate, rugose and finely pubescent on upper surface, softly white-pubescent or subvillous beneath, narrowed or somewhat rounded at the base, petioles  $\frac{1}{4}$ - $\frac{3}{8}$  in. long. Flowers inodorous, sessile, arranged in axillary peduncles heads or spikes  $\frac{1}{2}$   $\frac{3}{4}$  in. long and elongating in fruit; peduncles 1-3 $\frac{1}{4}$  in., usually in opposite axils, 4-angled, thickening upwards; bracts up to  $\frac{3}{8}$  in. long, ovate, acuminate, softly hairy on both sides. Calyx  $\frac{1}{10}$  in. long, truncate, membranous, densely hairy. Corolla with a pale purplish limb  $\frac{1}{2}$  in. across, hairy outside; tube  $\frac{1}{2}$  in. long, yellowish; lobes 4, rounded. Filaments very short. Ovary glabrous. Drupe purple when ripe, enclosed in the thin transparent calyx.

Plentiful within the area of this flora, in waste places. Flowers during the greater part of the year. DISTRIB. Throughout the warmer portion of India and in Ceylon, ascending to 3,500 ft. in Kumaon; also in Upper Burma, Afghanistan, Baluchistan and in Trop. Africa. The leaves are regarded by the natives as a cure for snake-bite.

*L. Camara*, Linn; F. B. I. iv, 562; Watt E. D.; Kanjilal For. Fl. 269; Gamble, Man. Ind. Timb. 524; Prain Beng. Pl. 824; Cooke Fl. Bomb. ii, 419. *L. aculeata*, Linn.; Roxb. Hort., Beng. 46.—A large climbing shrub with prickly branches and orange-coloured flowers. It is a native of Trop. America, whence it has spread and become naturalized in many parts of the Old World. It appears to have been introduced into Ceylon about the year 1824, and from there to have spread throughout Peninsular India and northwards as far as Dehra Dun. As an undergrowth in forests, although beneficial to some extent as affording shelter to young trees, it has nevertheless proved itself to be a very troublesome weed in deciduous forests, and very difficult to eradicate.

*L. trifolia*, Linn.; F. B. I. iv, 563; Prain Beng. Pl. 824.—A small unarmed shrub with usually ternate leaves. This is also a native of Trop. America, and has been recorded as a naturalized plant by Royle and others from N. W. India to Ceylon, as well as in E. Bengal. It closely resembles *L. indica*.





ribbed; lobes 5, short. *Corolla-tube* straight or curved; limb oblique, somewhat 2-lipped; lobes 5, oblong, obtuse or retuse. *Stamens* didynamous, included; anthers ovate, 2-celled, cells subparallel. *Ovary* more or less 4-lobed and sometimes 4-celled even when in flower, style short, stigma obscurely 2-lobed; ovules 4, attached laterally near the base of each cell. *Fruit* dry, included in the calyx, separating into 4 oblong pyrenes.—Species about 80, in temperate and tropical regions, mostly American.

**V. officinalis**, Linn. *Sp. Pl.* 20; Roxb. *Hort. Beng.* 4; Royle *III.* 299; F. B. I. iv, 565; Watt *E. D.*; Collett *Fl. Siml.* 379; Prain *Beng. Pl.* 826; Cooke *Fl. Bomb.* iii. 437.—Vervain.

An erect more or less pubescent perennial herb. *Stems* 1-3 ft. high, decumbent at the base, branched 4-sided puberulous. *Leaves* 2-4 in. long, variously lobed, narrowed to the base; lower ones stalked, pinnatifid or coarsely toothed, more or less pubescent and usually hoary on the nerves beneath; upper sessile, usually 3-partite. *Flowers*  $\frac{1}{4}$  in. long, sessile in dense bracteate heads which elongate as the fruit ripens into slender spikes up to 10 in. long; bracts ovate, acute. *Calyx* twice as long as the bracts and half as long as the corolla-tube, minutely 5-toothed, glandular-hairy. *Corolla* blue or lilac, hairy; limb spreading, about  $\frac{1}{4}$  in. diam., lobes subquadrate, throat hairy. *Fruit* dry, pyrenes ribbed.

On waste ground and also as a weed in gardens, mostly along the northern portion of the area. **DISTRIB.** Plains of Punjab and Bengal, and up to 7,000 ft. on the Himalaya from Kashmir eastwards; also in all temperate and subtropical regions, but not wild in America. The leaves and root are used medicinally by the people of the Punjab. The many varieties of the cultivated garden *verbena*, so extensively grown in Europe as well as in India, are hybrids and are supposed to be chiefly related to *V. chamædrifolia*, a species indigenous in S. America.

#### 4. **CALLICARPA**, Linn.; *Fl. Brit. Ind.* iv, 566.

Shrubs or trees; young branches stellately hairy. *Leaves* opposite, rarely ternately whorled, toothed or subentire. *Flowers* in axillary cymes which are shorter than the leaves; bracts linear, inconspicuous. *Calyx* very small, campanulate; limb minutely 4-lobed, not enlarged in fruit. *Corolla* small, tubular, subsymmetric, purple or red; lobes 4, subquadrate, spreading. *Stamens* 4, equal; anthers exerted, 2-celled, glandular. *Ovary* imperfectly 2-celled, style linear; stigma dilated, obscurely bifid, ovules 2 in. each cell. *Fruit* a small globose drupe; pyrenes 4, or fewer by suppression, 1-seeded.—Species 30, widely distributed in the tropical and subtropical regions of both hemispheres.



terminal panicles; bracts small, narrow. *Calyx* campanulate, shortly 5-6-lobed, enlarged in fruit. *Corolla* white, tube short, limb with 5 or 6 nearly equal spreading imbricate lobes. *Stamens* 5 or 6, adnate to the base of the corolla, equal, exserted, anthers ovate or oblong. *Ovary* 4-celled, with 1 ovule in each cell, style linear, stigma shortly bifid. *Fruit* a drupe, enclosed in the enlarged 4-celled bladder-like calyx, endocarp bony.—Species 3, two of which are Indian, and the third is a native of the Philippine Islands.

**T. grandis**, Linn. f. *Suppl.* 151; Roxb.; *Fl. Ind.* i, 600; Royle *Ill.* 299; Brand. *For. Fl.* 354, t. 44; *Ind. Trees* 505; F. B. I. iv, 570; Watt *E. D.*; *Comm. Prod. Ind.*; Kanjilal *For. Fl.* 269; Gamble *Man. Ind. Timb.* 526; *Prañ Beng. Pl.* 828; *Cooke Fl. Bomb.* ii, 424 — Vern. Ságun, Saigun, Sáj.—The Teak-tree.

A large deciduous tree, 80-120 ft. high; branchlets 4-angular, stellately tomentose. *Leaves* about 12 in. long (or much larger in seedling specimens), elliptic or obovate, acute or acuminate, entire, usually cuneate at the base; upper surface rough, but glabrous, the lower densely clothed with gray or yellowish tomentum, main lateral nerves 8-10 pairs. *Flowers* many, on short pedicels and arranged in large terminal much-branched tomentose cymose panicles 1-3 ft. long; bracts at the forks lanceolate, those beneath the calyx narrower. *Calyx* (in flower)  $\frac{1}{2}$  in. long, broadly campanulate, stellately tomentose; lobes  $\frac{1}{10}$  in. long, subequal, spreading; the whole calyx ultimately enlarging to 1 in. or more and forming a membranous bladder-like covering to the fruit. *Corolla* white, glabrous, limb  $\frac{1}{4}$  in. across; lobes subequal, spreading. *Fruit* subglobose,  $\frac{1}{2}$  in. in diam, somewhat 4-lobed; pericarp soft, densely clothed with felted stellate hairs.

## 6. GMELINA, Linn.; *Fl. Brit. Ind.* iv, 581.

Trees or shrubs, sometimes spinous; young shoots usually tomentose. *Leaves* opposite, entire toothed or lobed. *Flowers* large, yellow or brownish, arranged in panicles usually tomentose cymes; bracts usually narrow, rarely leaf-like, bracteoles none. *Calyx* campanulate, shortly 5 or 4-toothed or subentire, persistent and unaltered in fruit. *Corolla* 2-lipped; tube slender below, swollen upwards, limb 5 or 4-lobed. *Stamens* didynamous, sub-exserted; anthers with oblong more or less separate cells. *Ovary* 4-celled, with 1 ovule in each cell, style slender, stigma shortly bifid. *Fruit* a succulent drupe; endocarp bony, undivided, 4 or 2-celled.—Species about 8, in India, China, Malaya and Australia.

**G. arborea**, Roxb. *Hort. Beng.* 46; *Fl. Ind.* iii, 84; Royle *Ill.* 299; Brand. *For. Fl.* 364; *Ind. Trees* 509; F. B. I. iv, 581; Watt *E. D.*;

*Nerpal* Fl. Pl. 551; *Gamble Man. Ind. Timb.* 537; *Prain Beng. Pl.* 820; *Cook's Fl. Bomb.* ii, 421.—Vern. *Gavlar, gumar, gamthar, Bhandra, rutan* (Rajputana).

An unarmed deciduous tree, up to 60 ft. high; bark somewhat corky, greyish outside and yellow within; young parts covered with white mealy pubescence. *Leaves* 4-8 in. long, broadly ovate, acuminate, entire; upper surface glabrous when mature, lower persistently clothed with fulvous stellate hairs, base cordate or truncate and shortly cuneate; petioles 2-3 in. long, cylindric, puberulous, glandular at the top. *Flowers* in small usually 3-flowered cymes which are arranged along the branches of a densely fulvous-tomentoso panicle about 12 in. in length; buds clavate, angled; bracts  $\frac{1}{2}$  in. long, linear-lanceolate. *Calyx* broadly campanulate,  $\frac{1}{2}$  in. long, densely fulvous-tomentose; teeth small, triangular, acute. *Corolla* 5-lobed,  $1\frac{1}{2}$  in. long, brownish-yellow, very hairy outside; upper lip  $\frac{1}{2}$  in. long, deeply divided into 2 oblong obtuse lobes; lower lip about twice as long, 3-lobed, the middle lobe much longer than the lateral ones and with a crenulate margin. *Drupe*  $\frac{1}{4}$ -1 in. long, ovoid or pyriform, smooth, orange-yellow when ripe.

Not uncommon within the area in moist sal forests, from Dohra Dun eastwards along the Sub-Himalayan tracts; also in Merwara and Bundelkhand. Often grown in gardens. Flowers usually in April and before the new leaves appear. **DISTRIB.** Outer Himalayan ranges from the Panjab eastwards, up to 3,000 ft., Aravalli Hills, Bengal and southwards to the Deccan, S. India and Ceylon; also in Burma, extending to the Malay Islands and the Philippines. The wood, which greatly resembles that of teak, is much valued, for it is easily worked and lasts well under water. Various parts of the tree are used medicinally, and the fruit is much eaten by various kinds of deer.

*G. asiatica*, L. *Roxb. Fl. Ind.* iii, 87; *Brandis For. Fl.* 305; *Ind. Trees* 509; *F. B. I.* iv, 582; *Watt E. D.*; *Gamble Man. Ind. Timb.* 537; *Prain Beng. Pl.* 820; *Cook's Fl. Bomb.* ii, 425.—A spinous shrub with bright yellow flowers. It is cultivated in gardens within the area, and is found wild in S. India, Ceylon and the Malay Archipelago. The plant is useful for making fences. The root is used medicinally and also the leaves which are said to render water mucilaginous.

## 7. PREMNA, Linn.; Fl. Brit. Ind. iv, 571.

Trees or shrubs, sometimes scandent. *Leaves* opposite, entire or toothed. *Flowers* small, greenish or white, often polygamous, pubescent, arranged in paniced or corymbose cymes; bracts small, narrow. *Calyx* small, cup-shaped; limb truncate or minutely 2-5-

toothed, or 2-lipped. *Corolla* small, tube short, throat hairy inside, limb 2-lipped 5-lobed or subequally 4 lobed. *Stamens* didynamous; anthers ovate or rounded, the cells parallel or divergent. *Ovary* 2- or 4-celled, 4-ovuled, style linear, stigma shortly bifid. *Fruit* a small globose or oblong-obovoid drupe; endocarp hard, undivided, normally 4- or by abortion 1-3-celled. *Seeds* 1-4, oblong.—Species 40 or more, in the warmer regions of the Old World.

Leaves usually quite entire and with a cuneate base, corymbs large, calyx 5-toothed.—A medium-sized tree . . . . . 1. *P. mucronata*.

Leaves more or less toothed when mature; corymbs small, usually compact:—

Leaves petioled, sparingly toothed, calyx 4-toothed.—A shrub or small tree. . . . . 2. *P. barbata*.

Leaves sessile, coarsely toothed, calyx 5-toothed.—A small almost stemless under-shrub . . . . . 3. *P. herbacea*.

1. *P. mucronata*, Roxb. *Fl. Ind.* iii, 80; Royle *Ill.* 299; Brandis *For. Fl.* 366; *Ind. Trees* 511. *P. latifolia*, var. *mucronata*, F. B. I. iv, 578. Watt *E. D.*; Kanjilal *For. Fl.* 264; Gamble *Man. Ind. Timb.* 537; Prain *Beng. Pl.* 831. Vern. *Bakar, basota*.

A small or medium-sized deciduous tree; branchlets and young leaves pubescent or velvety. *Leaves* membranous, drying black, 3-6 in. long broadly ovate, sharply acuminate, usually quite entire, base cuneate; upper surface glabrous when mature, the lower hairy especially on the midrib, petioles  $\frac{1}{2}$ – $\frac{3}{4}$  in. long. *Corymbs* broad, usually terminating short leafy branchlets, rusty-pubescent. *Calyx* 5-toothed, clothed with spreading hairs. *Corolla* greenish-white,  $\frac{1}{4}$  in. long, pubescent within. *Drupe* globose, verrucose.

Dehra Dun and Siwalik range and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, often found on the outskirts of sal forests, recorded also from Bundelkhand. Flowers April-June. **DISTRIB.** Outer Himalayan ranges to Bhutan, up to 3,000 ft., also in N. Bengal and on the Khasia Hills. The wood is hard and yields good fuel, and it is sometimes used for lighting fires by friction. The juice of the bark is said to be used medicinally. Gamble (in his *Manual* p. 537) refers to a moderate-sized thorny tree which he found at Kasumri on the Saharanpur Siwaliks as having thin greyish-white smooth bark, and with the leaves drying green (not black), but otherwise resembling *P. mucronata*.

2. *P. barbata*, Wall. *Cat.* 1768; Brand. *For. Fl.* 367; *Ind. Trees* 511; F. B. I. iv, 579; Kanjilal *For. Fl.* 264; Gamble *Man. Ind. Timb.* 535; Prain *Beng. Pl.* 831.—Vern. *Lamenar, lamnar, bakarchu* (Dehra Dun).

A shrub or small tree with dark-grey bark. *Leaves* 3-7 in. long, oblong or ovate, acuminate, obtuse or subcordate in fruit, usually distinctly toothed, sometimes with only a few teeth towards the apex, puberulous on both surfaces when young, nearly glabrous on upper surface when mature; main lateral nerves 6 pairs; veins reticulate, dark, conspicuous; petiole 1 in. long or more. *Corymbs* rather dense, 1-2½ in. in diam., villous, glabrescent in fruit; bracts small, linear, deciduous. *Calyx* ½ in. long, subequally 4-toothed, glabrous or puberulous; teeth oblong, obtuse, enlarged and ribbed in fruit. *Corolla* ½-⅝ in. long, throat hairy within. *Drupe* ⅓ in. in diam., globose or subovoid, glabrous, subverrucose.

Sub-Himalayan tracts from Dehra Dun eastwards. **DISTRIB.** Outer Himalayan ranges from the Chenab eastwards to Bhutan up to 5,000 ft.; also in Assam, Bengal, the Central Prov. and Upper Burma.

3. *P. herbacea*, Roxb. *Hort. Beng.* 46; *Fl. Ind.* iii, 80; Brandis *For. Fl.* 368; *Ind. Trees* 511; *F. B. I.* iv, 591; *Watt E. D.*; Kanjilal, *For. Fl.* 264; *Gamble Man Ind. Timb.* 535; *Prain Beng. Pl.* 831. *P. pygmaea*, Wall; *Royle Ill.* 209.

A small almost stemless undershrub. Flowering branches 1-4 in. long, springing up annually after the jungle fires. *Leaves* 1-5 in. long, in rosettes of 2 or 3 pairs, lying flat on the ground, sessile, obovate, obtuse, cuneate at the base, margins coarsely serrate, nerves pubescent; upper surface (when mature) minutely gland-dotted, the lower clothed with very small deciduous hairs. *Flowers* in peduncled cymes arranged in terminal somewhat dense pubescent corymbs 1½ in. in diam. *Calyx* ⅞ in. long, subequally 5-toothed, closely pubescent; lobes ovate, obtuse. *Corolla* pale-yellow or greenish, ⅓ in. long, throat hairy inside, limb obscurely 2-lipped, lobes 4. *Drupe* ¼ in. in diam., globose, black when ripe.

Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. *Flowers* Feb.-May. **DISTRIB.** Subtrop. Himalaya from Kashmir to Bhutan, usually in open grassy places; also in Bengal and in the Sikkim Terai, extending to the southern portion of the W. Peninsula. A good example of a plant belonging to a genus mostly represented by trees or shrubs, and which has become permanently dwarfed by continuous exposure to periodical fires.

### 8. *VITEX*, Linn.; *Fl. Brit. Ind.* iv, 583.

Trees or shrubs; young shoots hairy or tomentose. *Leaves* opposite, digitately 3-5-foliate (often simple in *V. trifolia*). *Flowers* in peduncled or sessile cymes forming terminal and axillary or wholly axillary panicles or corymbs; bracts small, longer or shorter than the calyx. *Calyx* campanulate, truncate or shortly 5-rarely 3-toothed. *Corolla* small, 2-lipped, tube short, limb 5-lobed,

central lobe of lower lip usually largest. *Stamens* didynamous, usually exserted; anther-cells at first parallel and pendulous, afterwards divaricate, often twisted so that their bases become suberect. *Ovary* 2-4-celled, with 1. ovule in each cell, style filiform, stigma shortly bifid. *Fruit* a globose or obovoid drupe supported by the somewhat enlarged calyx; endocarp bony, 4-or by suppression 3-1-celled. *Seeds* obovate or oblong.—Species 100, in all tropical and warm temperate regions.

**1. V. Negundo**, Linn. *Sp. Pl.* 638; Roxb. *Fl. Ind.* iii, 70; Royle *Ill.* 299; Brandis *For. Fl.* 369; *Ind. Trees* 503; F. B. I. iv, 583; Watt *E. D.*; Kanjilal *For. Fl.* 265; Gamble *Man. Ind. Timb.* 539; Collett *Fl. Siml.* 380; Prain *Beng. Pl.* 833; Cooke *Fl. Bomb.* ii, 428.—Vern. *Shiwari*, *mewri*, *nishinda* (Dehra Dun), *malla* (Saharanpur) *shamalu* (Bijnor).

A shrub or small tree, with a thin grey bark; branchlets 4-angled, densely white-tomentose. *Leaves* 3-5-foliolate; leaflets stalked, 2-2½ in. long, lanceolate, acute, entire or rarely crenate, subglabrous above, white-tomentose beneath, petiolule of terminal leaflet ¾-1 in. long; lateral smaller and with much shorter petiolules, common petiole 1-1½ in. long. *Flowers* in peduncled cymes forming large terminal often compound pyramidal panicles; branches 4-angled, closely white-tomentose bracts 1-1½ in. long, lanceolate, caducous. *Calyx* ½ in. long, white-tomentose; teeth small, triangular. *Corolla* ¾ in. long, lavender to blue, tomentose outside, hairy at the insertion of stamens; upper lip deeply 2-lobed; lobes obtuse, mid-lobe broadly obovate, crenulate; the two lateral ones shorter, oblong, obtuse. *Drupe* about ½ in. in diam., black when ripe.

Abundant within the area of this flora in waste ground and on the banks of streams, also much planted to form hedges. Flowers during the greater part of the year, but chiefly between March and April. **DISTRIB.** Throughout India and in Ceylon. N. W. Himalaya up to 5,000 ft. and westwards to Peshawar and Afghanistan, extending to Trop. Africa and Madagascar, and to China and the Philippines. The plant is much recommended for the regeneration and reclamation of forest-land, especially in those areas which are liable to injury by floods. The branches are largely used for wattle-work and in the manufacture of baskets, and the leaves laid over stored grain are said to keep off insects. The roots, leaves and fruit are used in native medicine, and the ashes are largely employed as an alkali in dyeing. The plant appears to be not much eaten by cattle.

**V. trifolia**, Linn., a species closely allied to the preceding, and with a somewhat similar distribution in India, is known only as a cultivated plant within this area. It may be distinguished by its simple or 3-foliolate leaves, by its sessile always entire obtuse leaflets and also by its rather larger flowers and fruit. Outside India it is found in Burma and in the Malay Archipelago, and from China, Japan and the Philippines to N. Australia.



## 9. CLERODENDRON, Linn.; Fl. Brit. Ind. iv, 589.

Trees or shrubs, sometimes sarmentose. *Leaves* opposite, rarely 3-4-nate, simple entire or lobed. *Flowers* in axillary cymes or terminal panicles, often leafy below, bracts conspicuous or small. *Calyx* campanulate; limb truncate 5-toothed or almost 5-partite, persistent, often accrescent, sometimes coloured. *Corolla-tube* slender, usually long, limb more or less oblique; lobes 5, spreading. *Stamens* didynamous, much exerted; anthers ovate or oblong, the cells parallel. *Ovary* imperfectly 4-celled, with 1 ovule in each cell, style filiform, stigma shortly bifid. *Fruit* a globose usually succulent drupe, 4-grooved and separating into 4 pyrenes of which; 1-3 are sometimes suppressed.—Species about 100, chiefly in the warm regions of the Old World, a few in Trop. America.

Corolla irregularly salver-shaped,  $\frac{3}{4}$  in. long or less:—

Calyx not or only slightly enlarged in fruit:—

Calyx-lobes long, ovate-acuminate; leaves opposite, less than 3 in. long . . . . . 1. *C. Phlomidis*.

Calyx-lobes very short, broadly triangular; leaves often in whorls of 3, reaching more than 6 in. long . . . . . 2. *C. serratum*.

Calyx much enlarged in fruit and turning red . . . . . 3. *C. infortunatum*.

Corolla narrowly funnel-shaped, 3-4 in. long or longer . . . . . 4. *C. Siphonanthus*.

1. *C. Phlomidis*, Linn. f. *Suppl.* 292; *Cooke Fl. Bomb.* ii, 431. *C. phlomoides*, Linn. f.; *Roxb. Fl. Ind.* iii, 57; *Royle Ill.* 299; *Brandis For. Fl.* 363; *Ind. Trees* 507; *F. B. I.* iv, 590; *Watt E. D.*; *Gamble Man. Ind. Timb.* 543; *Prain Beng. Pl.* 835.—Vern. *Urui*.

A large shrub, or small tree, up to 30 ft. high; young parts pubescent. *Leaves*  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. long, ovate or subhomboid, obtuse or acute, coarsely crenate-dentate or entire, undulate, glabrous above, more or less puberulous beneath, base truncate or subcordate, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in., pubescent. *Flowers* medium-sized, in small 2-chotomous axillary cymes forming a rounded terminal panicle; pedicels slender; bracts leaf-like, obovate or lanceolate, acute, *Calyx* about  $\frac{3}{4}$  in. long, divided about  $\frac{1}{2}$ -way down, glabrous or puberulous, slightly enlarged in fruit; lobes ovate, acutely acuminate, veined. *Corolla* white or pink; tube  $\frac{3}{4}$  in. long, sparingly pubescent outside; lobes under  $\frac{1}{4}$  in. long, elliptic, obtuse, veined. *Drupe*  $\frac{1}{4}$  in. long, broadly obovoid, black when ripe.

Common in the drier parts of the area, and often found in hedges, also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers during

the greater part of the year. **DISTRIB.** Throughout the drier parts of India from the Punjab and Bengal to S. India and Ceylon, also in Baluchistan. The roots are used in native medicine.

2. *C. serratum*, Spreng. *Syst. Veg.* ii, 758; Don *Prod.* 103; Brandis *For. Fl.* 364; Ind. *Trees* 508; F. B. I. iv, 592; Watt *E. D.*; Kanjilal *For. Fl.* 266; Gamble *Man. Ind. Timb.* 543; Prain *Beng. Pl.* 835; Cooke *Fl. Bomb. ii*, 432. *Volkameria serrata*, Linn.; Roxb. *Fl. Ind.* iii, 62.—Vern. Barangi (N. Oudh), ban-bakri (Jaunsar).

A shrub 3-8 ft. high, or sometimes occurring as a perennial herb, nearly glabrous. *Stems* bluntly 4-angular, often burnt down during the periodic jungle fires. *Leaves* sessile or nearly so, opposite or sometimes ternate, passing upwards into bracts, usually about 5-6 in. long, sometimes much longer, narrowly obovate-oblong or subelliptic, acute or acuminate, usually coarsely and sharply serrate, glabrous when mature or more or less pubescent beneath, base cuneate. *Flowers* many, conspicuous, arranged in dichotomous cymes, the whole forming a lax more or less pubescent subpyramidal panicle 6-10 in. long; bracts sub-persistent, obovate to lanceolate, pubescent, often coloured. *Calyx*  $\frac{1}{4}$  in. long, cup-shaped, hardly enlarged in fruit; lobes minute, broadly triangular, ciliolate. *Corolla* blue purple or white, 2-lipped, glabrous outside; lower lip large, often directed upwards by reason of the twisting of the pedicels, usually purple; tube  $\frac{3}{4}$  in. long, cylindric, the 2 upper and 2 lateral lobes  $\frac{1}{2}$  in. long, spreading. *Filaments* curved, very hairy at their bases. *Drupe* about  $\frac{1}{4}$  in. long broadly obovoid, rather succulent, dark-purple when ripe.

Common in the Sub-Himalayan tracts from Dehra Dun eastwards. *Flowers* April-Aug. **DISTRIB.** Outer Himalayan ranges up to 5,000 ft., and on the Khasia Hills, and thence throughout Cent. and S. India to Ceylon and the Malay Peninsula. The root, leaves and seeds are used in native medicine; the young leaves and the flowers are eaten as a vegetable, and the Santals are said to make use of the root for bringing about the fermentation of their rice-beer.

3. *C. infortunatum*, Linn. *Sp. Pl.* 637; Royle *Ill.* 299; Brand. *For. Fl.* 363; Ind. *Trees* 507; F. B. I. iv, 594; Watt *E. D.*; Kanjilal *For. Fl.* 267; Gamble *Man. Ind. Timb.* 543; Prain *Beng. Pl.* 835; Cooke *Fl. Bomb. ii*, 432. *Volkameria infortunata*, Roxb. *Fl. Ind.* iii, 59.—Vern. Bhant, karu (Dehra Dun).

A shrub up to 12 ft. high, often gregarious; branchlets bluntly 4-angular, clothed with yellowish-white pubescence. *Leaves* 4-10 in. long, ovate, acuminate, entire or denticulate, sparingly hairy on both sides, base cordate or rounded; petioles  $1\frac{1}{2}$ -4 in., cylindric, hairy. *Flowers* on rather long, pedicels, arranged in peduncled cymes and forming a large terminal panicle; bracts leaf-like, deciduous. *Calyx*  $\frac{1}{2}$  in. long (in flower), 5-partite, silky-pubescent, much enlarged in fruit; segments broadly lanceolate, very acute. *Corolla* densely hairy outside, white



bifid. *Fruit* an obovoid drupe, included in the accrescent calyx, divaricately 4-lobed about half-way down, pyrenes 1-4.—Species 4, Himalaya, Africa and Madagascar.

**H. sanguinea**, Retz. Obs. vi, 31; Dcne. in Jacquem. Vog. Bot. t. 140; Brand. For. Fl. 370; Ind. Trees 506; F. B. I. iv, 596; Watt E. D.; Kanjilal For. Fl. 267; Gamble Man. Ind. Timb. 544; Collett Fl. Siml. 380; Prain Beng. Pl. 836. *Hastingsia coccinea*, Smith; Roxb. Fl. Ind. iii, 65. *Hastingsia scandens* Roxb. l.c. 66. Vern. *Rilhoul* (Dehra Dun).

A nearly glabrous straggling shrub, 10-30 ft. high. *Leaves* stalked, about 3 in. long, ovate, acuminate, toothed or entire, cordate at the base; petioles about  $\frac{1}{2}$  in. long. *Flowers* crowded in axillary stalked cymes. *Calyx* scarlet tinged with orange, much enlarged in fruit, tube very short; limb spreading, about 1 in. in diam. when in fruit, membranous, circular, entire. *Corolla* coloured like the calyx,  $\frac{3}{4}$ -1 in. long; tube nearly cylindric, curved; limb short, obscurely 2-lipped, lobes unequal, lowest the longest. *Drupe*  $\frac{1}{4}$ - $\frac{1}{2}$  in., nearly dry.

Dehra Dun in shady ravines, and eastwards in the Sub-Himalayan tracts. Flowers Oct.-Dec. **DISTRIB.** Subtropical Himalaya from the Sutlej to Bhutan up to 5,000 ft., extending to Chota Nagpur, Assam and Burma. Often grown in gardens.

## 11. CARYOPTERIS, Bunge; Fl. Brit. Ind. iv, 597.

Erect or rambling shrubs. *Leaves* opposite, acuminate, toothed or subentire, minutely punctate with yellow glistening glands. *Flowers* in small dense many-flowered cymes, axillary or passing into a terminal thyrses, bracts small, bracteoles none. *Calyx* 5-partite; segments triangular or lanceolate, somewhat accrescent. *Corolla* 2-lipped; tube short, cylindric, limb spreading, middle lobe of lower lip the longest, crisped or fimbriate. *Stamens* didynamous, anthers exserted; cells divaricate confluent. *Ovary* imperfectly 4-celled, ovules 1 in each cell, style filiform, stigma shortly 2-fid. *Fruit* a small globose capsule, separating into 4 concave valves with incurved margins retaining the seeds.—Species 5, Himalaya, extending to Japan.

**C. Wallichiana**, Schauer in DC. Prod. xi, 625; Brandis For. Fl. 370; Ind. Trees 512; F. B. I. iv, 597; Watt E. D.; Kanjilal For. Fl. 268; Gamble, Man. Ind. Timb. 544; Collett Fl. Siml. 381; Prain Beng. Pl. 836. Vern. *Karui* (Dehra Dun).

An erect or spreading shrub; bark grey, papery; branchlets 4-sided, young shoots grey-pubescent or subtomentose. *Leaves* shortly stalked, about 4 in. long, elliptic or lanceolate, acuminate, toothed or subentire, canescent. *Cymes* arranged mostly in terminal thyrses 3-5 in. long



discrete or confluent cells dehiscing longitudinally. *Disk* prominent. *Ovary* superior, of two 2-celled carpels; style simple, inserted between the lobes stigma usually 2-fid., sometimes unequally; ovules 1 in each lobe, erect, anatropous. *Fruit* of 4 dry or rarely fleshy 1-seeded nutlets at the base of the calyx, sometimes 1 or more suppressed. *Seeds* small, albumen scanty or none.—Species about 3,000, chiefly in warm dry temperate regions.

Ovary 4-partite; areola of nutlets small, basilar or placed somewhat obliquely to the outer side :—

Stamens 4, all perfect and declinate, anther-cells at length confluent :—

Attachment of nutlets basilar :—

Lower lip of corolla declinate, flat or slightly concave, generally narrower, but hardly longer than the 3-4-lobed upper lip :—

Calyx deflexed in fruit; upper lobe widest, large, ovate, recurved, the margins decurrent on the tube :—

Corolla-tube short, lower lip flat,  
stigma 2-fid . . . . .

1. OCIMUM.

Corolla-tube usually long, lower  
lip concave, stigma entire . . . .

2. ORTHOSIPHON.

Calyx suberect or declinate in fruit,  
upper lobe broader than the others,  
margins not decurrent on the  
tube :—

Whorls crowded in terminal and  
axillary globose or ovoid heads  
with imbricate bracts, calyx sub-  
erect . . . . .

3. ACROCEPHALUS.

Whorls forming long terminal spi-  
cate racemes; bracts white, con-  
spicuous. calyx usually declinate

4. GENIOSPORUM.

Lower lip of corolla deflexed, concave  
or boat-shaped, much longer than  
the upper lip :—

Calyx equally 5-toothed or somewhat  
2-lipped, with a 3-toothed upper  
and a 2-toothed lower lip, or with  
the upper lobe large rounded and  
reflexed, the others narrow and  
subulate . . . . .

5. PLECTRANTHUS.

Calyx very oblique, suberect, 2-lipped; upper lip large, entire inflexed and closing the mouth: lower lip truncate, obscurely toothed . . . . .

6. ANISOCHILUS.

Attachment of nutlets slightly oblique to the outer side, the nutlets also dorsally attached to the lobes of the disk and leaving a large areola on separation; calyx-lobes subequal, 13-15-nerved; corolla 2-lipped, lobes all flat and spreading, stamens included in the tube . . . . .

7. LAVANDULA.

Stamens erect spreading or ascending:—

Stamens 4, all perfect:—

Corolla-lobes 4, flat, sub-equal and similar; stamens subequal, anther-cells confluent:—

Calyx 5-toothed. teeth equal, stamens exserted, filaments usually bearded:—

Lower lobe of corolla flat, spreading; whorls in glomerate or in solitary interrupted spikes:— .

8. POGOSTEMON.

Lower lobe of corolla like the others; whorls in slender dense continuous spikes . . . .

9. DYSOPHYLLA.

Calyx 5-partite; segments plumose in flower, pappose in fruit; whorls in slender cylindric spikes; stamens of female flowers included, filaments naked . . . . .

10. COLEBROOKIA.

Corolla 2-lipped, stamens didynamous:—

Anterior pair of stamens the longer:—

Calyx 13-nerved, anthers 2-celled:—

Calyx equally 5-toothed . . .

11. MICROMERIA.

Calyx distinctly 2-lipped . . .

12. CALAMINTHA.

Calyx 5-10-nerved:—

Upper lip of corolla short, nearly flat; anthers of upper stamens 2-celled, of lower 1-celled, the cells transverse and parallel .

13. ANISOMELIS.

Upper lip of corolla hooded :—

Upper lip of corolla not woolly ;  
calyx 2-lipped, with a broad  
plate at the back, the mouth  
closed after flowering . . . 14. SCUTELLARIA.

Upper lip of corolla woolly ;  
calyx 5-10-toothed, its mouth  
remaining open after flower-  
ing :—

Calyx 5-toothed, leaves more  
or less lobed or cut :—

Anther-cells connivent,  
calyx teeth spinescent . . . 15. LEONURUS.

Anther-cells divergent :—

A shrub, flowers white  
tinged with pink . . . 16. ROTLEA.

An erect robust, herb,  
leaves mostly radical,  
flowers yellow, nutlets  
bearded at the apex . . . 17. EREMOSTACHYS.

Calyx 6-10-toothed, anther-  
cells divergent :—

Lower lip of corolla longer  
than the upper lip . . . 18. LEUCAS.

Lower lip of corolla shorter  
than the upper lip . . . 19. LEONOTIS.

Posterior pair of stamens the longer ;  
calyx 5-toothed, 15-nerved, stamens  
not exserted . . . . . 20. NEPETA.

Perfect stamens 2 :—

Lower (anterior) pair of stamens per-  
fect, filaments short ; anther-cells  
linear, separated by an elongated  
connective which is jointed with the  
filaments ; upper arm of connective  
ascending and bearing one fertile  
anther-cell, lower arm horizontal or  
deflexed and bearing a fertile or an  
empty cell or naked, nutlets trique-  
trous . . . . . 21. SALVIA.

Upper (posticous) pair of stamens per-  
fect, anther-cells not separated by  
an elongated connective, nutlets  
uniglobose . . . . . 22. MOSLA.



Ovary 4-lobed, nutlets with a large oblique or lateral areola on the inner side; stamens 4, perfect, erect, exserted from the notch or fissure of the upper lip.

Corolla deeply slit behind and apparently 1-lipped, the two small upper lobes along with the small lateral pair springing from the contracted base of the very large lower lobe . . . . .

23. TEUCRIUM.

Corolla distinctly 2-lipped; upper lip short, 2-lobed, notched; lateral pair of lobes very small, springing from the sides of the very large lower lobe . . . . .

24. AJUGA.

# 1. OCIMUM, Linn.; Fl. Brit. Ind. iv, 607.

Strongly scented herbs shrubs or undershrubs. *Flowers* small, in 6-10-flowered whorls, spicate or racemose, pedicels with recurved tips; bracts minute, caducous. *Calyx* 2-lipped, ovoid or campanulate, deflexed, enlarged and strongly veined in fruit; upper lip broad, flat, decurrent; lower with 4 mucronate teeth. *Corolla* 2-lipped; tube short, not annulate within; upper lip subequally 4-fid.; lower hardly longer than the upper, declinate, entire. *Stamens* didynamous, declinate, exserted; filaments free or the lower pair connate below, naked or the upper toothed or hairy below, anther-cells confluent. *Disk* entire or 3-4-lobed. *Ovary* 4-partite, style-lobes subulate or flattened. *Nutlets* dry, smooth or subrugose, mucilaginous when moistened, basal scar small.—Species about 60, in tropical and warm temperate regions of both hemispheres.

Pedicels as long as or longer than the calyx, the 2 lower cal.-teeth exceeding the upper lip 1. *O. sanctum*.

Pedicels shorter than the calyx:—

Bracts sessile, longer than calyx, the 2 lower cal.-teeth minute . . . . . 2. *O. gratissimum*.

Bracts stalked, shorter than calyx, the 2 lower cal.-teeth longer than the upper lip:—

Corolla  $\frac{1}{6}$ – $\frac{1}{5}$  in. long . . . . . 3. *O. canum*.

Corolla  $\frac{2}{5}$ – $\frac{1}{2}$  in. long . . . . . 4. *O. Basilicum*.

1. *O. sanctum*. Linn. Mant. i, 85; Roxb. Fl. Ind. iii, 14; F. B. I. iv 609; Watt E. D.; Duthie F. & G. Crops, N. W. Prov. iii, 50; Kunjila

*For. Fl.* 272; *Prain Beng. Pl.* 843; *Cooke Fl. Bomb. ii*, 440.—Vern. *Tulsi*, *krishna tulsi*. Holy Basil.

A much-branched herb, 1-2 ft. high, sometimes woody at the base; stems and branches clothed with soft spreading hairs. *Leaves* 1-2 in. long, oblong or elliptic-oblong, obtuse or acute, entire or subserrate, hairy on both surfaces and minutely dotted, petioles  $\frac{1}{2}$ -1 in. long. *Racemes* slender, 6-8 in. long; bracts not exceeding the calyx, broadly ovate or cordate-ovate, acuminate, ciliate; pedicels slender, as long as or longer than the calyx. *Calyx*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, elongating in fruit; upper lip much reflexed, broadly obovate, apiculate; lower lip exceeding the upper, the two central teeth with long slender awns which curve upwards beyond the upper; the two lateral teeth with short straight awns. *Corolla*  $\frac{1}{2}$  in. long, purplish-pink, upper lip hairy on the back. *Filaments* of upper pair of stamens with a small bearded appendage at the base. *Nutlets* broadly ellipsoid, smooth, yellow dotted with black.

Much cultivated within the area by Hindus, and often occurring as if wild. This is one of their most sacred plants and is to be found in every Hindu garden and around their temples.—*DISTRIB.* Throughout India and in Ceylon, and up to 6,000 ft. on the Himalaya, extending also from W. Asia and Arabia to the Malay Islands and Australia. Native country uncertain. Beads for rosaries are made from the woody stems, and all parts of the plant are used medicinally.

2. *O. gratissimum*, Linn. *Sp. Pl.* 1197; *Roxb. Fl. Ind. iii*, 17; *F. B. I. iv.*, 608; *Watt E. D.*; *Prain Beng. Pl.* 843; *Cooke Fl. Bomb. ii*, 441.—Vern. *Rām tulsi*. Shrubby Basil.

A much branched shrub, 4-6 ft. high, young branches pubescent. *Leaves* 2½-5 in. long, elliptic-lanceolate, acute, coarsely crenate or serrate, pubescent and gland-dotted on both sides, base cuneate; petioles 1-2½ in., slender, pubescent. *Racemes* rather short, simple or branched, rhachis softly pubescent; bracts sessile, longer than the calyx, broadly ovate, acuminate, ciliate; pedicels softly hairy, shorter than the calyx. *Calyx*  $\frac{1}{2}$  in. long, elongating in fruit, pubescent and glandular; upper lip longer than lower one, rounded and curved upwards in fruit; lower lip strongly nerved, shortly toothed, the two central subulate ones a little longer than the broadly lanceolate lateral ones. *Corolla*  $\frac{1}{2}$  in. long, greenish-yellow, hairy outside; upper lip  $\frac{1}{2}$  in. broad, teeth rounded; lower lip longer and narrower. *Filaments* of upper pair of stamens with a bearded appendage at the base. *Nutlets* subglobose, brown, rugose.

Cultivated within the area and apparently wild in Merwara.—*DISTRIB.* Throughout India, in Ceylon and Java; found also in Trop. Africa, but its native country is not known for certain. The leaves and seeds are used medicinally.

3. *O. canum*, Sims in *Bot. Mag.* 2452; *Royle Ill.* 301; *F. B. I. iv.* 607; *Watt E. D.*; *Prain Beng. Pl.* 843; *Cooke Fl. Bomb. ii*, 440. *O. album*,

Roxb.; *Fl. Ind.* iii, 15 (not of Linn).—Vern. *Bharbari* (Beng.), *Rām tulsi* (Bombay). *Hoary tulsi*.

An erect much-branched herb, 6-24 in. high, young parts pubescent. *Leaves*  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, elliptic-lanceolate, entire or with shallow teeth, gland-dotted; petiole  $\frac{1}{2}$ -1 in. long, slender, hairy. *Spikes* 3-8 in. long; whorls rather close, 6-fld.; bracts stalked, elliptic-lanceolate, ciliate; pedicels shorter than the calyx. *Calyx*  $\frac{1}{2}$  in. long, pubescent; upper lip rounded, flat, reticulately veined, mucronate, ciliate; lower lip with the two central awned teeth longer than the two lateral ones and exceeding the upper lip. *Corolla* white,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, upper lip broadly oblong, 4-toothed at the subtruncate apex, shorter and broader than the oblong obtuse lower lip. *Filaments* very long, the 2 upper ones toothed at the base. *Nutlets* ellipsoid, black.

Cultivated in Bundelkhand and probably elsewhere within the area.—**DISTRIB.** Plains and lower hills of India, also in Ceylon, Java and in Trop. Africa, where by some authors it is believed to be indigenous. The leaves are used medicinally.

4. *O. Basilicum*, Linn. *Sp. Pl.* 597; Roxb. *Fl. Ind.* iii, 17; Royle *Ill.* 301; F. B. I. iv, 608; Dulhie *Field and Gard. Crops N. W. Prov. and Oudh*, part iii, 50; Watt *E. D.*; Prain *Beng. Fl.* 843; Cooke *Fl. Bomb.* ii, 442. *O. pilosum*, and *O. caryophyllatum*, Roxb. *Fl. Ind.* iii, 16.—Vern. *Kāli tulsi*, *babui tulsi* Sweet Basil.

An erect branching herb, 2-3 ft. high, glabrous or more or less hispidly pubescent. *Stems* and branches green or sometimes purplish. *Leaves* 1-2 in. or more long, ovate, acute, entire or more or less toothed or lobed; base cuneate, entire, petiole  $\frac{1}{2}$ -1 in. long. Whorls densely racemose, the terminal raceme usually much longer than the lateral ones; bracts stalked, shorter than the calyx, ovate, acute. *Calyx*  $\frac{1}{2}$  in. long, enlarging in fruit, very shortly pedicelled; lower lip with the 2 central teeth longer than the rounded upper lip. *Corolla*  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, white pink or purplish, glabrous or variously pubescent. *Stamens* slightly exserted, upper filaments toothed at the base. *Nutlets* about  $\frac{1}{12}$  in. long, ellipsoid, black and pitted.

Sweet Basil is much grown in native gardens within this area, and is sometimes met with as if wild.—**DISTRIB.** Dr Aitchison considered it to be truly indigenous on the lower hills of the Punjab. It is cultivated throughout the greater part of India and in Ceylon, also in Burma and generally within the tropics of the E. Hemisphere and in Polynesia. *O. Basilicum* is a more robust plant than *O. canum* and has much larger flowers and seeds. There are numerous varieties, differing from one another as to the degree of hairiness and in the colour of their stems and flowers. The form usually regarded as typical has quite smooth green leaves and white flowers. The plant is strongly aromatic and is much used by the natives as a flavouring ingredient. The seeds swell up in water and form a jelly which is employed medicinally.

## 2. ORTHOSIPHON, Benth.; Fl. Brit Ind. iv, 612.

Undershrubs or shrubs. *Flowers* racemose in 6-or fewer-flowered whorls, bracts small. *Calyx* ovoid campanulate or tubular, deflexed in fruit; upper tooth broad, membranous, margins decurrent on the tube; lateral and lower teeth distinct or shortly connate, usually subulate. *Corolla* 2-lipped, tube often slender, straight or incurved, upper lip 3-4-fid.; lower entire, concave. *Stamens* didynamous, declinate; filaments free, toothless at the base, anther-cells confluent. *Disk* usually gibbous. *Ovary* 4-partite, style with a minute capitate or clavate entire or notched stigma. *Nutlets* dry, ovoid or globose, smooth or nearly so, basal scar small. Species about 60, in the warmer regions of the Old World.

Corolla-tube about as long as the calyx . 1. *O. pallidus*.

Corolla-tube twice as long as the calyx . 2. *O. rubicundus*.

1. *O. pallidus*, Royle Mss. ex Benth. in Hook. Bot. Misc. iii, 370; F. B. I. iv, 613; Prain Beng. Pl. 844; Cooke Fl. Bomb. ii, 442.

A low diffuse undershrub, 6-12 in high; branches many from a woody root-stock, 4-angular, finely pubescent or subglabrous. *Leaves* petioled, not scented,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, ovate, obtuse or acute, coarsely serrate or crenate, glabrous or sparingly hairy; base cuneate, entire, petiole  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. *Racemes* rather short; whorls distant, 6-flowered; bracts minute, hairy; pedicels about as long as the calyx in flower, hairy. *Calyx*  $\frac{1}{2}$  in. long, enlarging to twice as long in fruit, hairy below; upper lip with 3 obtuse lobes; lower lip membranous, strongly parallel-nerved, the 2 central teeth narrowly lanceolate and ending in a long up-curved awn exceeding the upper lip; lateral teeth broadly lanceolate and with short straight awns. *Corolla* white or lilac,  $\frac{1}{4}$  in. long, tube about as long as the calyx; upper lip shorter than the rounded and concave lower lip. *Nutlets* subglobose, smooth, pale-brown.

Sub-Himalayan tracts of N. Oudh (Duthie), Banks of the Jumna (Royle), Lucknow (T. Anderson), Bundelkhand (Duthie). Flowers in July. **DISTRIB.** Throughout the greater part of India from Kashmir and the Punjab to W. Behar and southwards to Travancore; extending to Gilgit, Baluchistan, Aden and Arabia.

2. *O. rubicundus*, Benth. in Wall. Pl. As. Bar. ii, 14; F. B. I. iv, 614; Prain Beng. Pl. 844. *O. virgatus*, Benth. l.c. *Ocimum tuberosum*. Roxb. Fl. Ind. iii, 18. *Plectranthus rubicundus*, Don Prod. 116.

An erect perennial herb with a woody often tuberous rootstock. *Stems* slender, 1-2 ft. high, 4-angled, pubescent or glabrate. *Leaves* usually sessile, 2-4 in. long, ovate or ovate-lanceolate, coarsely crenate or serrate, base cuneate. *Flowers* in rather distant whorls, bracts minute. *Calyx*

hairy, lower lip with 4 subulate teeth. *Corolla* white or pink,  $\frac{1}{2}$  in. long, its tube twice as long as the calyx. *Nutlets* subobovoid, compressed, punctulate.

Not uncommon in the Sub-Himalayan tracts from Dehra Dun and the Siwalik range eastwards. Flowers April—June. Distr. W. Himalaya from Kashmir to Nepal ascending to 5,000 ft. and from W. Bengal to the Nilgiri Hills, extending to Upper Burma and China. Specimens obtained by Duthie's collectors in the Belraich District of N. Oudh are furnished with large fusiform root-tubers similar to those of *Boerhaavia suffruticosa* and of other under-brush which become modified by the action of periodical fires. This is probably Roxburgh's *Ocimum tuberosum*. Benthams *Orthosephon virgatus* has taller stems, much narrower leaves and shorter racemes; the whorls also are more remote and fewer-flowered, the calyx is coloured and the corolla is smaller. This form was found by Wallich at Gourahpur; it occurs also in Dehra Dun (Duthie) and up to 3,000 ft in Kumaon (S. and W.), and was collected by Collett in Upper Burma.

### 3. ACROCEPHALUS, Benth.; Fl. Brit. Ind. iv, 611.

Annual or perennial herbs. *Leaves* small, opposite or whorled, petioled. *Flowers* very small, sessile; whorls in terminal or axillary globose or ovoid dense heads with imbricate bracts. *Calyx* 2-lipped, ovoid, tubular in fruit, base gibbous; upper lip flat, usually entire, lower-entire or 4-toothed, throat notched. *Corolla* small, somewhat 2-lipped upper lip subequally 4-lobed; lower entire scarcely longer than the upper. *Stamens* didynamous, declinate; filaments free, included, toothless. *Disk* small, gibbous. Ovary 4-partite, style shortly 2-fid. *Nutlets* dry, smooth, beak star small.—Species about 40, in Trop. and Subtrop. Asia, also in Trop. Africa and in Madagascar.

*A. capitatus*. Benth. in Wall. Pl. As. Rer. ii, 18; R. gl. iii, 391; F. B. I. iv, 611; Collett Fl. Sincl. 354; Prain B. As. Pl. 844; C. C. Fl. Bomb. ii, 443.

An annual, 6-12 in. high. *Stems* simple or branching from the base bluntly 4-angled, glabrous or nearly so. *Leaves* glabrous,  $\frac{1}{2}$ -1 in. long, ovate or lanceolate, subacute, coarsely serrate, tapering at the base and often decurrent into an obscure petiole. *Heads*  $\frac{1}{2}$ -1 in. in diam., globose or ovoid, often with 2 spreading leaves at the base, peduncles 4-angled. *Whorls* close; bracts shorter than the fruiting calyx, broadly obovate, shortly acuminate, base cuneate. *Calyx* (in flower)  $\frac{1}{2}$  in. long, elongating in fruit, hairy outside; upper lip oblong, entire, rounded at the apex; lower lip shorter, 4-toothed. *Corolla*  $\frac{1}{2}$  in. long, pale-purple. *Nutlets* oblong-ellipsoid, compressed, dark-brown when ripe.

Dehra Dun (Gamble and Duthie), Moradabad (T. Thomson). Flowers July to October. **DISTRIB.** Throughout India, chiefly in the hilly districts, Himalaya up to 5,000 ft. from Kashmir to Bhutan, extending to Burma, Java and Borneo.

#### 4. GENIOSPORUM, Wall.; Fl. Brit. Ind., iv, 609.

Herbs. *Flowers* small or minute; whorls many-flowered, in long lax racemes or spikes, bracts often coloured. *Calyx* ovoid in flower, tubular in fruit, suberect or declinate, 5-toothed: upper tooth broadest, not decurrent; lateral free or connate with the upper; lowest pair short, free or connate. *Corolla* 2-lipped, tube short, upper lip 4-fid.; lower declinate, entire. *Stamens* didynamous, declinate, filaments free, toothless. *Disk* swollen, gibbous. *Ovary* 4-partite, style-arms short, flattened. *Nutlets* dry, ovoid or oblong, smooth or punctulate. Species about 12, in Tropical Asia and Africa and in Madagascar.

**G. strobiliferum**, Wall. *Pl. As. Rar.* ii, 18; *F. B. I.* iv, 610. *Plectranthus coloratus*, Don *Prod.* 116.

An erect puberulous herb. *Stem* 2-3 ft. high, obtusely angled. *Leaves* 2-5 in. long, lanceolate, coarsely serrate, base acute or rounded, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers*  $\frac{1}{2}$  in. long, arranged in spikes 2-5 in. long; bracts leaf-like, white, deciduous, exceeding the pedicelled flowers. *Calyx* pubescent, with 2 black glands on the lower lip, ovoid in flower, erect and tubular in fruit, throat glabrous. *Corolla* white with purple veins, lower lip narrow. *Stamens* exserted. *Nutlets* ellipsoid, black hispid towards the apex.

Dehra Dun (Gamble and Duthie). Flowers July to Oct. **DISTRIB.** In dry forests from Kumaon to Bhutan up to 5,000 ft., also on the Khasia Mts.

#### 5. PLECTRANTHUS, L'Herit.; Fl. Brit. Ind. iv, 616.

Herbs or undershrubs. *Flowers* usually small, in lax (rarely close) paniced or racemose 6-8-flowered cymes. *Calyx* usually 2-lipped; lobes 5, subequal or the upper widest, enlarged in fruit. *Corolla* 2-lipped; tube exserted, long or short, straight or decurved, throat equal or obliquely swollen; upper lip usually short, broad, 4-fid., recurved; lower much longer, entire, boat-shaped, stipitate or narrowed at the base. *Stamens* didynamous, declinate; filaments simple, free, anther-cells usually confluent. *Disk* usually enlarged in front. *Ovary* 4-partite, style subequally 2-fid. *Nutlets* orbicular ovoid or oblong, smooth granulate or punctate, basal scar small.—Species about 90, in Trop. and Sub-trop. Asia, Africa, Australia and Polynesia.

Fruiting calyx decurved, corolla blue . . . . . 1. *P. Coetsa*.

Fruiting calyx erect; corolla white spotted with pink . . . . . 2. *P. ternifolius*.

1. *P. Coetsa*, Buch.-Ham. ex D. Don Prod. 117; F. B. I. iv, 619; Collett Fl. Siml. 355; Cooke Fl. Bomb. ii, 447.

A tall erect much-branched strong-smelling perennial herb, 3-6 ft. high. Stems stout, 4-angled, pubescent, often tinged with red. Leaves  $1\frac{1}{2}$ -4 in. long, ovate or ovate-lanceolate, acute, crenate or serrate, softly pubescent above, white-tomentose beneath, base tapering into the more or less winged petiole, nerves and veins prominent beneath; petioles  $\frac{1}{2}$ -1 in. long, stout, woolly. Flowers in many short cymes which are arranged in long axillary and terminal pubescent panicle racemes; pedicels slender, deflexed, hairy. Calyx clothed with stiff grey hairs, in flower  $\frac{1}{2}$ - $\frac{3}{4}$  in. long and campanulate, decurved in fruit and tubular; tube curved, 10-ribbed; teeth subequal, acute. Corolla  $\frac{3}{4}$ -1 in. long, lavender-blue, hairy outside, tube abruptly decurved; upper lip obscurely lobed; lower longer, boat-shaped. Nutlets broadly ellipsoid or suborbicular smooth, yellow.

Dohra Dun, in the Nakraunda swamp (Kanjilal). DISTRIB. Sub-trop. and Temp. Himalaya from the Punjab to Mishmi, up to 8,000 ft.; also on the Khasia Hills and in Burma, extending to Afghanistan, the Konkan, Deccan, S India and Ceylon.

2. *P. ternifolius*, D. Don Prod. 117; F. B. I. iv, 621; Kanjilal For. Fl. 272; Collett Fl. Siml. 356; Prain Beng. Pl. 846; Brandis Ind. Trees 516. Elsholtzia Thompsoni, Hook. f. in F. B. I. iv, 643.

A bush-like herb, 3-6 ft. high; branches erect, densely white-tomentose. Leaves opposite and ternately whorled, sessile or nearly so, thick rugose, 2-6 in. long, lanceolate, acuminate, serrate, base acute; upper surface hairy, lower white-tomentose. Cymes shortly stalked, crowded in erect cylindric villous racemes forming terminal panicles, lower bracts leaf-like. Calyx tomentose; tube campanulate when in flower elongate tubular and erect in fruit; teeth subequal, acute. Corolla white with pink spots at the base of the upper lip; tube inflated, longer than the calyx, limb very short. Nutlets trigonous, acuminate.

Dohra Dun, at Karwapani (Kanjilal); N. Oudh, at Gadughat (R. Thompson), Kheri forests (Hearle). DISTRIB. Outer Himalayan ranges from Kashmir eastwards, up to 5,000 ft.; also in Bengal, the Khasia Hills, Manipur, Upper Burma and Tonkin.

## 6. ANISOCHILUS, Wall.; Fl. Brit. Ind. iv, 627.

Herbs or undershrubs. Flowers small, in dense oblong-4-angled or cylindric spikes, bracts caducous. Calyx suberect, inflated below the middle, 2-lipped or 5-toothed, rarely 1-lipped; upper lip entire and deflexed, or short and minutely 3-lobed; lower lip short, truncate obscurely toothed or none. Corolla 2-lipped; tube slender, decurved,

throat inflated; upper lip short, entire or 3-4-fid.; lower elongate, concave. *Stamens* didynamous, declinate, filaments free. *Disk* lobed. *Ovary* 4-partite, style 2-fid. at the apex. *Nutlets* dry, ovoid, smooth, basal scar small.—Species about 15, all confined to India except one in Trop. Africa.

**A. carnosus**, Wall. *Pl. As. Rar.* ii, 18; *Royle Ill.* 301; *F. B. I.* iv, 627; *Watt E. D.*; *Prain Beng. Pl.* 847; *Cooke Fl. Bomb.* ii, 450. *Aeriocephalus*, Benth.; *F. B. I. l.c.* *Plectranthus strobiliferus*, Roxb. *Fl. Ind.* iii, 23. Vern. *Panjiri*.

An erect annual, 1-2 ft. high. *Stem* stout, bluntly 4-angled, glabrous or sparsely pubescent, often tinged with red. *Leaves* rather fleshy, 1-2½ in. long, broadly ovate, obtuse, crenate, rounded or subcordate at the base, usually hairy beneath, petioles ½-1½ in. long. *Spikes* ½-1½ in. long, 4-gonous in flower and becoming cylindrical in fruit, peduncles slender; bracts ½ in. long, ovate, acuminate, ciliate, glandular. *Calyx* pubescent, ½ in. long, enlarging in fruit; upper lip ovate-lanceolate, acute, ciliolate, bending over the lower lip and closing the mouth of the calyx when in fruit; lower lip truncate, its membranous ciliate tip reflexed and appressed against the tube. *Corolla* pale-purple, ¾ in long, hairy outside; upper lip short, erect, with shallow lobes. *Nutlets* suborbicular, compressed, polished and brown when ripe.

Upper Gangetic Plain (Wallich), Banks of Jumna from Delhi to Allahabad (Royle), Bundelkhand (Edgeworth). Flowers Sep. and Oct. **DISTRIB.** W. Himalaya, up to 8,000 ft. in Garhwal and Kumaon, and southwards through C. and S. India to Ceylon, extending to Ava.

## 7. LAVANDULA, Linn.; *Fl. Brit. Ind.* iv, 630.

Herbs or shrubs. *Leaves* incised or entire. *Flowers* in 2-10-flowered whorls forming simple or branched spikes, bracts persistent. *Calyx* erect, ovoid, tubular, shortly and equally 5-toothed, 13-15-nerved. *Corolla* blue or purple, rarely white, oblique, 2-lipped; upper lip 2-fid., lower 3-partite, the lobes all spreading. *Stamens* didynamous, declinate, included, filaments free, anther-cells confluent. *Disk* equally 4-lobed. *Ovary* 4-partite, style shortly 2-fid., the lobes flattened. *Fruit* of 4 dry smooth nutlets, basal scar somewhat oblique.—Species 30, chiefly Mediterranean.

**L. Burmanni**, Benth. *Lab. Gen. & Sp.* 151; *Royle Ill.* 300; *F. B. I.* iv, 631; *Prain Beng. Pl.* 848; *Cooke Fl. Bomb.* ii, 452.

A slender erect herb. *Stems* 2-3 ft. high, simple or branched, 4-angled, pubescent. *Leaves* sessile or nearly so, 2-4 in. long and as broad as long, pinnatipartite or deeply pinnatisect; lobes linear, entire or cut or toothed, obtuse or subacute; glabrous or pubescent above, pale and



pubescent beneath. *Spikes* simple or more or less branched, or sometimes subumbellate, bracts pubescent,  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, broadly ovate and strongly nerved at the base, the apex ending in a long capillary awn. *Calyx* (in fruit) grey-pubescent,  $\frac{1}{2}$  in. long, tube somewhat curved; teeth lanceolate, acute and with pennicillate tips. *Corolla* blue or white, nearly  $\frac{1}{2}$  in. long, hairy outside; tube  $\frac{1}{2}$  in. long, slender below; upper lip  $\frac{1}{2}$  in. long; middle lobe of lower lip twice as long as the 2 lateral ones. *Nutlets* oblong-ellipsoid, mucilaginous when moistened.

Central India at Indore (Jacquemont). This is the only known record of this plant as occurring within the area of this flora. There is, however, every reason to suppose that it is not restricted to a single locality. Flowers Oct. and Nov. **DISTRIB.** Chota Nagpur, and in Western, Cent. and S. India.

### 8. POGOSTEMON, Desf.; Fl. Brit. Ind. iv, 631.

Herbs or undershrubs. *Leaves* opposite, rarely ternate. *Flowers* small, in simple or paniced spikes or contracted racemes formed of many dense-flowered subcapitate cymes (whorls). *Calyx* subequally 5-toothed. *Corolla* somewhat 2-lipped, 4-lobed; upper lip 3-lobed, the middle lobe often longer and narrower than the lateral; lower lip flat, spreading, narrow, entire. *Stamens* 4, subequal, exserted, straight or declinate, filaments usually bearded, anther-cells confluent. *Disk* subentire, equal. *Ovary* 4-partite, style shortly 2-fid. *Nutlets* dry, smooth, ovoid or oblong, basal scar small.—Species about 30, in India and Malaya to Japan.

**P. plectranthoides**, Desf. in *Mém. Mus. Par.* ii, 155, t. 6; *F. B. I.* iv, 632; *Kanjilal For.* Fl. 272; *Collett Fl. Siml.* 387; *Prair Beng. Pl.* 849, *Cooke Fl. Bomb.* ii, 454; *Brandis Ind. Trees* 516. *Mentha fruticosa*; *Roxb. Fl. Ind.* iii, 6.

A large gregarious aromatic bush; young parts grey-tomentose; branches terete or subquadrangular, often tinged with dark-purple, pith large. *Leaves* 2-5 in. long, ovate, acute, doubly serrate, rounded or cuneate at the base, petioles  $\frac{1}{2}$ - $1\frac{1}{4}$  in. long. *Flowers* in dense villous bracteate whorls crowded in numerous stout cylindric spikes 1-4 in. long, the whole forming an erect terminal panicle; bracts leaf-like, up to  $\frac{1}{2}$  in. long, ovate, acute, softly hairy and glandular, enclosing a fascicle of sessile flowers; bracteoles mostly linear-lanceolate, often tinged with purple. *Calyx*  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, glandular-pubescent; teeth triangular-lanceolate, ciliate, usually tinged with purple at the apex. *Corolla*  $\frac{1}{2}$  in. long, white tinged with pink; tube  $\frac{1}{2}$  in. long, slender, curved; upper lip  $\frac{1}{3}$  in. long; middle lobe longer and narrower than the 2 obtuse lateral ones; lower lip shorter than the upper, ovate-oblong; obtuse, entire. *Filaments* bearded with long lilac moniliform hairs. *Nutlets* minute, broadly ellipsoid, shining, dark-brown, when ripe.

Abundant within the area, especially in the Sub-Himalayan tracts from Dehra Dun to Gorakhpur, also in Bundelkhand. **DISTRIB.** W. Himalaya up to 5,000 ft., Punjab plain, Bengal, the Circars and in the Bombay Pres., also in Upper Burma. The ashes prepared from the stems are used in some places as manure for young rice plants. The scent of the leaves resembles that of black-currants. The true patchouly plant, from which the well-known scent is derived is, according to Prain, *P. Cablin*, Benth. (= *P. suavis*, Ten. and *P. Patchouli* var. *suavis*, Hook. f. in F. B. I. iv, 634). It is known only in cultivation, and it very seldom produces flowers. *P. Patchouli* of the F. B. I. is *P. Heyneanus*, Benth. and is recognized in commerce as "Indian patchouli."

### 9. **DYSOPHYLLA**, Blume; Fl. Brit. Ind. iv, 637.

Herbs. *Leaves* opposite or whorled. *Flowers* minute, in dense long spikes composed of numerous close-set many-flowered cymes. *Calyx* ovoid, 5-toothed, teeth subequal, throat naked within. *Corolla* small, tube exserted or included, limb equally 4-fid.; upper lobe entire or 2-fid., lower somewhat spreading. *Stamens* 4, exserted, straight or subdeclinate; filaments very long, bearded; anther-cells confluent. *Disk* equal, subentire. *Style* 2-fid., lobes subulate. *Nutlets* ovoid or oblong, smooth or granulate.—Species about 15, in Tropical Asia and in Australia.

**D. crassicaulis**, Benth. in Wall. Pl. As. Rar. i, 30; F. B. I. iv, 640; Collett Fl. Siml. 387; Prain Beng. Pl. 851. **VAR. pumila**, F. B. I. iv, l.c.; Prain l.c.; *D. pumila*, Benth. l.c. *Mentha verticillata*, Don Prod. 114.

A dwarf annual. *Stems* few, erect, 3-4 in. high, usually subglabrous. *Leaves* sessile, flat, usually in whorls of 4, about  $\frac{1}{2}$  in. long, narrowly oblong or oblanceolate, obtuse, distantly and rather coarsely toothed. *Spikes* terminal,  $\frac{1}{2}$ -1 in. long, dense, cylindric, sometimes interrupted below, rachis hairy; bracts exceeding the calyx, oblanceolate, obtuse, the lowest often leaf-like. *Calyx* hairy, teeth erect or conniving in fruit; lobes triangular, enlarging in fruit. *Corolla* purplish, tube exserted. *Filaments* bearded with bluish moniliform hairs. *Nutlets* very small, orbicular, compressed, pale, shining. Dehra Dun, in swampy ground at Kaluwala, elevation about 1500 ft. (Gamble). *Flowers* in Dec. **DISTRIB.** Northern Bengal. The type is abundant on the Himalaya from Kashmir to Sikkim; also in B. Bengal, Assam, Sylhet and on the Khasia Hills. The variety differs by its dwarf habit, much shorter spikes and the more hairy calyx.

### 10. **COLEBROOKIA**, Smith; Fl. Brit. Ind. iv, 642.

A densely hoary or woolly shrub. *Leaves* opposite or ternate, petioled, rugose, oblong-lanceolate, crenulate or serrulate. *Flowers*

small, functionally diœcious, arranged in paniced spikes, bracteoles connate. *Calyx-tube* very short; teeth long, subulate, elongating in fruit, capillary and plumose. *Corolla* small, tube very short; lobes 4, subequal. *Stamens* 4, equal, distant, exserted in the male flowers, included in the female flowers; filaments naked, anthers orbicular, cells confluent. *Disk* uniform. *Ovary* 4-partite, style 2-fid., protruded in the female flowers. *Nutlets* 1-4, obovoid, dry, with hairy tips, basal scar small.—A single species, confined to India and Burma.

**C. oppositifolia**, Sm. *Exot. Bot.* ii, 111, t. 115; *Rowb. Fl. Ind.* iii, 26; *F. B. I.* iv, 642; *Watt E. D.*; *Kanjilol For. Fl.* 270; *Gamble Man. Ind. Timb.* 547; *Collett Fl. Siml.* 385; *Prain Beng. Pl.* 851; *Cooke Fl. Bomb.* ii, 458; *Brandis Ind. Trees* 515. *C. ternifolia*, *Rowb.*; *Fl. Ind.* iii, 25.—*Vern. Pansra, binda* (Dehra Dun).

An erect tomentose much-branched shrub 4-10 ft. high; branches stout subquadrangular, grooved, usually in whorls of three. *Leaves* rugose, softly hairy on both surfaces, crowded towards the ends of the branches, opposite or in verticils of three, 4-6 in. long, oblong-lanceolate, acute, crenulate or serrulate, base acute, both surfaces softly hairy, petioles  $\frac{3}{8}$ -1 in. long. *Spikes* axillary or in panicles towards the ends of the branches, often 3-nately arranged, erect, cylindrical, slender when in flower, becoming much stouter in fruit; bracts solitary,  $\frac{1}{10}$  in. long, linear, pubescent; bracteoles many,  $\frac{1}{2}$  in. long, connate at the base. *Calyx* 5-partite,  $\frac{1}{10}$ - $\frac{1}{8}$  in. long; teeth subulate, plumose with white hairs, elongate in fruit and often with purple tips. *Corolla*  $\frac{1}{12}$  in. long, white. *Nutlets* usually solitary,  $\frac{1}{10}$  in. long, oblong-obovoid, hairy at the tip.

Dehra Dun and Siwalik range, in ravines and by water-courses extending along the Sub-Himalayan tracts and eastwards to Gorakhpur. Flowers in Jan. and Feb. **DISTRIB.** Himalaya up to 4,000 ft. from the Indus to Bhutan, and more or less throughout the hilly parts of Cent., W. and S. India, extending to Tenasserim, Upper Burma and China. The wood is used for making gunpowder-charcoal, and the leaves are applied to wounds and bruises.

# 11. MICROMERIA, Benth.; *Fl. Brit. Ind.* iv, 649.

Herbs or undershrubs. *Leaves* usually small, entire or toothed. *Flowers* small; whorls few- or many-flowered, in axillary or terminal spikes, rarely, paniced. *Calyx* 13-nerved, 5-toothed or 2-lipped. *Corolla* 2-lipped, tube straight; upper lip entire or emarginate, flattish; lower spreading, 3-fid. *Stamens* didynamous, the lower pair longer, ascending, incurved and with diverging apices; anther-cells distinct, parallel, at length diverging, connective usually thickened. *Ovary* 4-lobed; style 2-lobed, the lobes equal or the upper very

short; the lower recurved, flattened. *Nutlets* 4, dry, ovoid or oblong, basal scar small. — Species about 60, found in nearly all parts of the world, but not in Australia.

1. *M. capitellata*, Benth. in DC. Prod. ii, 218; F. B. I. iv, 649; Walt. E. D.; Prain Beng. Pl. 852; Cooke Fl. Bomb. ii, 459.

A slender herb, 1-2 ft. high, very aromatic, rootstock woody. Stems erect, 4-angled, pubescent, often tinged with purple. Leaves shortly stalked,  $\frac{1}{2}$ -1 in. long, ovate or oblong, subobtuse, hairy and gland-dotted on both surfaces; margins crenate or entire, ciliate, petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in. long. Flowers in distant subglobose whorls; cymes of lower whorls peduncled, the upper sessile, the whole forming a long slender spike-like raceme; floral leaves smaller upwards; bracts small, linear-lanceolate, hairy. Calyx  $\frac{1}{10}$  in. long (in flower), hairy and glandular, divided  $\frac{3}{4}$  of the way down into erect lanceolate ciliate teeth. Corolla  $\frac{1}{4}$  in. long, hairy outside; upper lip pale-violet, oblong and slightly emarginate; lower twice the length of the upper, dark-violet. Nutlets ellipsoid, smooth, brown when ripe.

Dehra Dun (Dathie). DISTRIB. Chota Nagpur, Deccan and on the Nilgiri Hills.

## 12. CALAMINTHA, Moench.; Fl. Brit. Ind. iv, 650.

Herbs or shrubs. Leaves entire or toothed. Flowers small, whorls dense and axillary or loose and paniced or in spikes. Calyx 13-nerved, 2-lipped, upper lip 3-toothed, lower 2-fid. and with narrower teeth, throat naked or villous. Corolla 2-lipped, tube straight, throat villous; upper lip erect, flattish; lower spreading, 3-lobed. Stamens didynamous (the upper pair rarely imperfect); lower pair longer, ascending under the upper lip; anther-cells distinct, parallel or diverging. Ovary 4-lobed; style 2-fid., the lobes equal, or the lower larger. Nutlets 4, minute, subglobose, dry, smooth. — Species 40, chiefly in temperate regions of the N. Hemisphere.

*C. umbrosa*, Fisch. and Mey. Ind. Sem. Hort. Petrop. vi, 6; F. B. I. iv, 650; Collett Fl. Siml. 393; Prain Beng. Pl. 853. Clinopodium repens, Roxb.; Fl. Ind. iii, 13.

A small slender procumbent or decumbent laxly hairy herb. Leaves  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, ovate, serrate. Flowers in small globose lax or densely flowered whorls; bracts small, not forming an involucre. Calyx  $\frac{1}{4}$  in. long; teeth of upper lip triangular, those of the lower longer and subulate. Corolla purple, hairy. Nutlets very small.

Dehra Dun, rather common DISTRIB. Temperate Himalaya from Kashmir to Bhutan, up to 12,000 ft., Khasia Mts. up to 4,000, and in the hills

portions of Peninsular India from the Konkan and southwards to Ceylon; extending to Afghanistan, the Caucasus range, China, Japan and Java. This species is closely allied to *C. Clinopodium* (Wild Basil), differing by its more slender and procumbent or decumbent habit; the bracts and calyx are much shorter, and the upper lip of the latter is more recurved.

**13 ANISOMELES.** R. Br.; Fl. Brit. Ind. iv, 672.

Tall erect branching coarse and more or less tomentose herbs. *Flowers* purplish, in axillary whorls, or in lax-flowered branching paniced cymes. *Calyx* ovoid or tubular, straight, limb equally 5-toothed. *Corolla* 2-lipped; tube short, annulate within; upper lip short, erect, entire; lower broad, spreading, 3-lobed; midlobe large, 2-fid. *Stamens* didynamous, exserted, the lower pair longer; anthers of upper pair 2-celled, those of the lower pair 1-celled, the cells transverse and parallel. *Disk* equal. *Ovary* 4-partite; style 2-fid., the lobes equal, subulate. *Nutlets* ovoid, obtuse, dry, basal scar small.—Species about 8, from Trop. and Subtrop. Asia to N. Australia.

*A. ovata*, R. Br. in Ait. Hort. Kew. ed. 2, ii, 264; Royle Ill. 301; F. B. I. iv, 672; Watt E. D.; Collett Fl. Siml. 402; Prain Beng. Pl. 853; Cooke Fl. Bomb. ii, 461. *A. ovata*, Var. *mollissima* Prain l.c. *Ajuga disticha*, Heyne; Roxb. Fl. Ind. iii, 2.

A suffruticose herb, 3-6 ft. high, sparingly hairy to densely pubescent or almost woolly. *Stems* acutely 4-angled. *Leaves* 1½-3 in. long, ovate, acute, crenate-serrate, thickly herbaceous, softly pubescent on both sides, base truncate rounded or rarely cuneate, the margins entire; petioles ½-1½ in. long, densely hairy. *Whorls* axillary, many flowered, more or less interrupted below, crowded above, the whole forming a dense spicate inflorescence; bracts ½-1 in. long, linear, clothed with long stiff hairs. *Calyx* subsessile, ½ in. long, enlarging in fruit, hirsute; teeth about as long as the tube, lanceolate, acute, ciliate. *Corolla* ½ in. long; upper lip pale-purple, ¼ in. long, oblong, rounded; lower lip deep-blue, much longer, the midlobe deeply 2-fid. *Filaments* bearded. *Nutlets* ⅓ in. long, smooth shining and black when ripe.

Very common within the area. Flowers after the rainy season. **DISTRIB.** Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya, extending to the Malay Peninsula and Islands to China and the Philippines. The form with densely woolly pubescence (*A. mollissima*, Wall.) and regarded by Prain as deserving varietal rank is abundant within our area. The whole plant has a strong scent resembling camphor.

**14. SCUTELLARIA**, Linn; Fl. Brit. Ind. iv, 667.

Herbs or undershrubs. *Inflorescence* various. *Calyx* campanulate, 2-lipped, lips closing after flowering; upper lip deciduous, furnished

on the back with a large deciduous shield or pouch (the posterior calyx-lobe), lower lip persistent. *Corolla* 2-lipped; tube long, usually sharply recurved beyond the calyx and then ascending, dilated at the throat, not annulate within; upper lip erect, galeate, entire or notched; lower broad, 3-lobed. *Stamens* didynamous; the lower pair longer, ascending under the galeate upper lip; anthers conniving, ciliate; those of the upper stamens 2-celled, of the lower 1-celled. *Disk* elongate. *Ovary* 4-partite, oblique; style 2-fid., the upper lobe very short. *Nutlets* 4, very minute, smooth, granulate or hispidulous.—Species about 90, in northern temperate regions, and on mountains in the tropics, abundant on the Andes.

*S. repens*, Buch.-Ham. ex D. Don Prod. 110; F. B. I. iv, 669; Collett Fl. Siml. 400.

A diffuse pubescent or tomentose herb with long rather stout 4-angled curved brittle stems; branches crowded, ascending. *Leaves* stalked,  $\frac{1}{2}$ –1½ in. long, ovate, acute, the lower ones usually crenate-serrate, upper entire; base acute or truncate, rarely subcordate, petioles  $\frac{1}{2}$ –1 in. long. *Flowers*  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, arranged in curved glandular-hairy racemes 6–10 in. long; bracts  $\frac{1}{2}$ –1 in. long, ovate, longer than the pedicel and calyx, but hardly leaf-like. *Corolla* dull-yellow with usually a tinge of purple, sharply recurved. *Nutlets* subgranulate.

In the Sub-Himalayan tract of the Gonda district in N. Oudh. DISTRIB. Himalaya from Kashmir to Sikkim up to 6,000 ft., usually amongst loose stones, extending to Ava.

### 15. LEONURUS, Linn.; Fl. Brit. Ind. iv, 677.

Erect stout leafy herbs. *Leaves* lobed. *Flowers* small, in dense-flowered distant axillary whorls. *Calyx* 5-nerved, turbinate; teeth 5, spreading, spinescent. *Corolla* 2-lipped, tube naked or annulate within; upper lip entire, erect; lower 3-fid., midlobe obcordate. *Stamens* didynamous, the lower pair the longest, filaments ascending, anthers conniving, cells transverse. *Disk* uniform. *Ovary* 4-partite, style 2-fid.; lobes equal, obtuse or subulate. *Fruit* of 4 triquetrous smooth dry nutlets, truncate at the apex, basal scar small.—Species 10, in Europe, Asia, Africa and America.

*L. sibiricus*, Linn. Sp. Pl. 594; F. B. I. iv, 673; Prain Beng. Pl. 854; Cooke Fl. Bomb. ii, 463.

An annual, 2–6 ft. high, glabrous or more or less pubescent. *Stems* bluntly 4-angled, sulcate. *Leaves*  $1\frac{1}{2}$ –4 in. long, palmatifid; segments linear, incised, glabrous or nearly so on the upper surface, pale beneath and more or less pubescent on the prominent nerves, petioles

up to 2 in. long. Floral leaves of upper whorls usually entire; bracts  $\frac{1}{2}$  in. long, spine-cent. *Calyx*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, glabrous or slightly pubescent; teeth triangular, spine-tipped. *Corolla* red, up to  $\frac{1}{2}$  in. long; tube as long as the limb, annulate within; upper lip hooded, hairy; lower equalling the upper, the 2 lateral lobes rounded. *Nutlets*  $\frac{1}{16}$  in. long.

Widely dispersed within the area, but often as a naturalized plant. Flowers after the rainy season. **DISTRIB.** Plains of India from Bengal and Sylhet to Kurg, but doubtfully indigenous. The plant has spread to Africa and America from trop Asia.

### 16. ROYLEA, Wall.; Fl. Brit. Ind. iv, 679.

A tall hoary shrub or undershrub. *Leaves* shortly petioled, deeply crenate-toothed or lobed. *Whorls* axillary, 6-10-flowered; bracteoles small, subulate. *Calyx-tube* cylindric, 10-nerved; lobes 5, large, obovate-oblong, obtuse, rigid, reticulate-veined. *Corolla* white or pinkish; tube included, cylindric, annulate within; upper lip erect, hooded, entire; lower spreading, 3-fid.; midlobe longest, entire. *Stamens* didynamous, lower pair longer; anthers conniving, the cells diverging. *Style-lobes* subequal, subulate. *Nutlets* ovoid-oblong, obtuse, smooth.—A single species, restricted to the Western Himalaya ascending to 5,000 ft. from the base of the outer ranges.

*R. calycina*, Briquet in Engl. and Prantl. Pflanzenf. iv, 3 a, 260. *R. elegans*, Wall.; F. B. I. iv, 679; Kanjital For. Fl. 271; Gamble Mar. Ind. Timb. 548; Collett Fl. Siml. 404; Brandis Ind. Trees 515. *Phlomis calycina*, Roxb. Fl. Ind. iii, 11. *Ballota cinerea*, Don Prod. 111.—Vern. *Kaur* (Punjab), *karanoi* (Jaunsar), *titpati* (Garhwal).

An erect much-branched shrub with grey bark, 3-5-ft. high; branches slender, terete, pale-brown, finely tomentose. *Leaves* 1-1 $\frac{1}{2}$  in. long, ovate, acute, deeply crenate or lobed, finely tomentose beneath, base cuneate, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers*  $\frac{1}{2}$  in. long. *Calyx* (in flower) nearly as long as the corolla; lobes erect, oblong, obtuse, much enlarged in fruit. *Corolla*  $\frac{1}{2}$  in. long, white or pinkish, hairy, upper lip hooded. *Nutlets*  $\frac{1}{2}$  in. long.

Dehra Dun **DISTRIB.** W. Himalaya from Kashmir to Nepal up to 5,000 ft.; abundant on hill-sides and often gregarious. Stewart states that the plant is used medicinally for its bitter tonic properties.

### 17. EREMOSTACHYS, Bunge.; Fl. Brit. Ind. iv, 694.

Erect herbs, usually not much branched. Radical leaves broad, toothed or incised; cauline few, smaller. *Whorls* densely many-flowered, axillary or in a terminal spike. *Calyx* subcampanulate,

dilated upwards into a broad membranous limb; teeth 5, equal, setaceous. *Corolla* 2-lipped, tube included; upper lip erect, hooded, bearded within; lower spreading, 3-lobed, midlobe largest. *Stamens* didynamous, ascending, the lower pair longer, filaments of upper pair fimbriate or appendaged at the base; anthers conniving, cells divaricate. *Disk* equal. *Style-lobes* equal, or the upper one shorter. *Nutlets* obovoid, triquetrous, truncate, their summit densely hairy.—Species 27, in W. Asia.

*E. superba*, Royle ex Benth. in Hook. Bot. Misc iii, 331; *Ill.* 303, t. 74; *F. B. I.* iv, 695.

A robust softly hairy herb, about 2 ft. high. *Stem* annual, from a large tuberous rootstock, erect, unbranched. *Radical leaves* petioled, 8-12 in. long, ovate in outline, pinnatisect, segments lobulate; lobules broad, obtuse; cauline leaves few, small, pinnatifid. *Whorls* many-flowered, crowded on a stout woolly spike 6-10 in. long; floral leaves erect, ovate, acute, concave, enclosing the flowers, deciduous. *Calyx* woolly,  $\frac{1}{2}$  in. long; mouth truncate, shortly and broadly 5-lobed. *Corolla* yellow tube included; upper lip galeate,  $\frac{1}{2}$  in. long, villous.

Siwalik range near the Mohand Pass (Royle, etc.). *DISTRIB.*: Punjab, near Peshawar (Vicary). An extremely local and very handsome plant. When cultivated in the Saharanpur garden, it used often to make its appearance as an escape on sheltered parts of the lawns.

### 18. LEUCAS, R. Br. Fl. Brit. Ind. iv, 630.

Herbs or undershrubs, usually woolly or villous. *Flowers* usually white, in axillary mostly distant whorls. *Calyx* 10-nerved, striate; mouth equal or oblique, equally or unequally 6-10-toothed. *Corolla* 2-lipped; tube included, annulate or naked within; upper lip erect, concave, externally villous; lower spreading, 3-fid., midlobe very large. *Stamens* didynamous, the lower pair longer, filaments ascending; anthers conniving, the cells divaricate, at length confluent, *Disk* entire or lobed, equal or glandular in front. *Ovary* 4-partite; style subulate at the apex, the posterior lobe obsolete. *Nutlets* 4, ovoid, triquetrous, obtuse, dry, basal scar small.—Species about 100, chiefly in Asia and Africa.

*Calyx-mouth* oblique:—

Mouth of calyx split above, much produced below

1. *L. urticifolia*.

Mouth of calyx projecting forward above:—

*Calyx-teeth* very short:—



Mouth of calyx glabrous within, whorls  
both axillary and terminal :—

Perennial, bipidly hairy; bracts  
few, subulate, mouth of calyx wide 2. *L. hysopifolia*.

Annual, mouth of calyx contracted :—

Calyx smooth below; bracts long,  
linear, filiform . . . . . 3. *L. aspera*.

Calyx smooth throughout; bracts  
few, short . . . . . 4. *L. tinifolia*.

Mouth of calyx hairy within; whorls  
terminal, very large, subglobose;  
bracts many, large, awned . . . . . 5. *L. Cephalotes*.

Calyx-teeth long and slender . . . . . 6. *L. nutans*.

Calyx-mouth straight or nearly so :—

Whorls many-flowered, flowers almost ses-  
sile, leaves and calyx more or less pubes-  
cent :—

Hairs on the stem and branches erect or  
spreading, not deflexed . . . . . 7. *L. lanata*.

Hairs on the stem and branches deflexed 8. *L. mollissima*.

Whorls 1-2-flowered, flowers pedicelled,  
leaves and calyx subglabrous . . . . . 9. *L. procumbens*.

1. *L. urticæfolia*, R. Br. *Prod.* 504; *Royle Ill.* 301; *F. B. I. iv*, 680;  
*Prain Beng. Pl.* 855; *Cooke Fl. Bomb. ii*, 464. *Phlomis urticæfolia*, Vahl;  
*Roxb. Fl. Ind.* iii, 11.

A tomentose or hairy annual, 6-18 in. high. *Stems* bluntly 4-angled, finely  
pubescent. *Leaves* rather thin, 1½-3 in. long, ovate, acute, coarsely  
serrate, acute or rounded at the base, petioles ½-1 in. long. *Flowers* in  
dense distant globose whorls up to 1 in. in diam.; bracts shortly stalked,  
½ in. long, narrowly lanceolate, aristate, ciliate, distinctly veined. *Calyx*  
½-1 in., cylindric, pubescent or villous; mouth very oblique, about 10-  
toothed; upper lip very small, with minute spinescent teeth; lower lip  
much prolonged, truncate, membranous and reticulate-veined, the 3  
lowest teeth the largest. *Corolla* white; tube ½ in. long, not annulate  
within, upper lip villous outside, midlobe of lower lip 2-fid. *Nutlets* ⅓  
in. long, obovoid-oblong, 3-gonous, glandular on the obliquely truncate  
apex, brown when ripe.

Morwara, Bundelkhand and in the districts of Agra and Delhi, extending  
eastwards to Patna (Madden). *DISTRIB.* Punjab Plain, W. Behar,  
Sind, Gujarat, Deccan and southwards to the Nilgiris, extending to  
Baluchistan, Arabia and Abyssinia.

2. *L. hyssopifolia*, Benth. in Wall. Pl. As. Rar. i, 60; F. B. I. iv, 690; Collett Fl. Siml. 405; Prain Beng. Pl. 855.

An erect hispidly hairy much-branched perennial herb, 4-8 in. high, hairs on stems usually spreading, rootstock woody. Leaves sessile, spreading or ascending, 1-2 in. long, linear, obtuse, often rigid; margins entire, recurved. Flowers  $\frac{3}{4}$  in. long, in small axillary and terminal whorls  $\frac{1}{2}$  in. in diam.; bracts few, slender, subulate. Calyx  $\frac{1}{4}$  in. long, obconic, glabrous; mouth very oblique, wide, truncate, glabrous within; teeth minute, erect.

Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh to Gorakhpur. Flowers in Oct. DISTRIB. Subtropical Himalaya from Jamu to Sikkim, up to 3,000 ft., also in Chota Nagpur.

3. *L. aspera*. Spreng. Syst ii, 745; F. B. I. iv, 690; Wall. E. D.; Prain Beng. Pl. 855; Cooke Fl. Bomb. ii, 465. *Phlomis esculenta*, Roxb. Fl. Ind. iii, 10.

An annual, 6-18 in. high, very variable. Stem stout erect, diffusely branched from below, hispid or scabrid, branches 4-angled. Leaves subsessile or with distinct petioles, linear or oblong, obtuse, entire or crenate, more or less pubescent, base tapering, petioles  $\frac{1}{10}$ - $\frac{1}{4}$  in. long. Flowers sessile or nearly so, in terminal and axillary whorls up to 1 in. in diam.; bracts nearly as long as the calyx, linear, acute and tipped with a bristle, margins ciliate. Calyx  $\frac{1}{2}$ - $\frac{1}{2}$  in. long; tube curved, constricted above the nutlets, lower portion usually glabrous, upper half ribbed and hispid or scabrid; mouth small, very oblique, not villous; upper lip produced forward; teeth small, triangular, bristle-tipped, ciliate, the upper one the largest. Corolla  $\frac{1}{2}$  in. long; tube  $\frac{1}{2}$  in., enlarged and hairy above, annulate within; upper lip  $\frac{1}{2}$  in. long, densely white-woolly; lower lip longer than upper; midlobe obovate, larger than the acute lateral ones. Nutlets  $\frac{1}{10}$  in. long, oblong with a subtruncate apex, smooth, brown.

Common within the area. Flowers Feb. to April. DISTRIB. Panjab, Plain, Behar and more or less throughout India, extending to Mauritius, Java and the Philippine Islands.

4. *L. unifolia*. Spreng. Syst. ii, 743; F. B. I. iv, 690; Wall. E. D.; Prain Beng. Pl. 856; Cooke Fl. Bomb. ii, 465. *Phlomis zeylanica*, Roxb. Fl. Ind. iii, 9.

An erect pubescent or tomentose annual, 1-2½ ft. high. Stem usually stout and much branched below, branches 4-angled. Leaves sessile or shortly stalked, 1½-4 in. long, linear-lanceolate, obtuse, entire or remotely serrate, clothed with appressed hairs or subglabrous, base tapering. Flowers shortly stalked, arranged in axillary and terminal whorls  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., usually towards the ends of the branches; bracts shorter than the calyx, setaceous, finely pubescent. Calyx  $\frac{1}{2}$ - $\frac{3}{4}$  in. glabrous or slightly pubescent; mouth very oblique, glabrous within; upper tooth large,

much produced forwards, very acute; the other teeth minute, distant, erect. *Corolla* white, less than  $\frac{1}{2}$  in. long; tube  $\frac{1}{4}$  in., annulate within; upper lip  $\frac{1}{2}$  in. long, white-woolly, lower lip  $\frac{1}{4}$  in. long. *Nutlets*  $\frac{1}{2}$  in., oblong, rounded at the apex, brown when ripe.

Dehra Dun, in cultivated ground. **DISTRIB.** Plains of India from Assam and Bengal, southwards to the Konkan, Deccan and Travancore, extending to Mauritius and the Malay Islands. Roxburgh mentions that this plant is used by the Brahmins to decorate their idols.

5. *L. Cephalotes*, Spreng. *Syst. ii*, 743; *F. B. I. iv*, 659; *Watt B. D.*; *Collett Fl. Siml.* 405; *Prain Beng. Pl.* 856; *Cooke Fl. Bomb. ii*, 466; *Phlomis Cephalotes*, Koen. ex Roxb.; *Fl. Ind. iii*, 10.—Vern. *Dhurpi sag*.

A pubescent or scaberulous annual, 1-3 ft. high, stems and branches obtusely angled, clothed with spreading hairs. *Leaves*  $1\frac{1}{2}$ -4 in. long, ovate or ovate-lanceolate, subacute, crenate-serrate, membranous, pubescent, tapering to the base, petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. *Flowers* sessile, in large dense globose terminal whorls 1-2 in. in diam., floral leaves similar to the cauline; bracts  $\frac{1}{2}$ - $\frac{3}{4}$  in. imbricate, leaf-like, acute and awned, green, thin, reticulately veined, ciliate. *Calyx* tubular, slightly curved,  $\frac{2}{3}$ - $\frac{3}{4}$  in. long, lower half glabrous, upper half pubescent outside and within, mouth oblique; teeth minute, subequal, narrowly triangular-subulate. *Corolla*  $\frac{3}{4}$  in. long, tube annulate within; upper lip  $\frac{1}{2}$  in. long, white-woolly; lower lip longer, its midlobe truncate. *Nutlets*  $\frac{1}{2}$  in. long, obovoid-oblong, smooth, brown.

A common weed in cultivated ground over the greater portion of the area. **DISTRIB.** Himalaya from Kashmir to Bhutan up to 6,000 ft., and southwards throughout India, but not in Ceylon. It is found in Afghanistan.

6. *L. nutans*, Spreng. *Syst. ii*, 743; *F. B. I. iv*, 688; *Prain Beng. Pl.* 856; *Cooke Fl. Bomb. ii*, 466.

A small straggling diffusely branched annual, 2-12 in. high; stems and branches 4-angled, laxly hairy. *Leaves* sessile or shortly stalked, 1-2 in. long, oblong or oblong-lanceolate, obtuse, subserrate. *Flowers* sessile or nearly so, in terminal and axillary many-flowered whorls about  $\frac{3}{4}$  in. in diam.; bracts  $\frac{1}{2}$ - $\frac{3}{4}$  in., leaf-like, slender, lanceolate, acute and bristle-tipped, veined, ciliate. *Calyx* (in fruit)  $\frac{3}{4}$  in. long, falcately decurved, strongly ribbed, hispid, tube hairy within, mouth oblique, the internal villi shorter than the teeth; teeth 10, the uppermost one the largest, the rest subequal and about  $\frac{1}{10}$  in. long, lanceolate, spine-tipped, ciliate. *Corolla* white, over  $\frac{1}{2}$  in. long; tube slender, annulate within near the base; upper lip white-woolly,  $\frac{1}{2}$  in. long; lower  $\frac{1}{4}$  in.; midlobe obovate, rounded. *Nutlets*  $\frac{1}{2}$  in. long, narrowly oblong-ellipsoid, smooth, brown.

Dehra Dun and in the Saharanpur District, also in the Jumna ravines of the Agra district. **DISTRIB.** Punjab Plain, Parasnath in Bengal, Sind, and southwards to the Deccan and S. India, and also in Burma.

7. *L. lanata*, Benth. in Wall. Pl. As. Rar. i, 61; F. B. I. iv, 681; Collett Fl. Siml. 405; Prain Beng. Pl. 856; Cooke Fl. Bomb. ii, 468.

A softly woolly or subsilky perennial herb, 2-3 ft. high; rootstock stout, woody; stem and branches bluntly 4-angled, clothed with erect hairs. Leaves thick, sessile or shortly petioled, 1-3 in. long, ovate, obtuse or acute, crenate or subserrate, rugose softly tomentose or silky, rounded or cuneate at the base. Flowers sessile, in many-flowered axillary whorls; bracts shorter than the calyx, setaceous, densely hairy and ciliate. Calyx  $\frac{3}{8}$  in. long, very silky outside, upper half of tube villous inside, mouth truncate; teeth minute, triangular-subulate. Corolla white, exceeding  $\frac{1}{2}$  in.; tube as long as the calyx, annulate above the middle; upper lip densely silky on both sides, midlobe of lower lip obovate, 2-fid. Nutlets oblong-obovoid, apex obliquely truncate.

Dehra Dun at Kansrao (Wallich), Gonda district of N. Oudh. (Duthie), Bundelkhand (Edgeworth). DISTRIB. W. Himalaya from Kashmir to Kumaon, up to 8,000 ft. and from the Konkan and Kanara to the Nilgiris, extending to Upper Burma and S. China.

8. *L. mollissima*, Wall. Pl. As. Rar. i, 62; Royle Ill. 301; F. B. I. iv, 682, Watt E. D.; Prain Beng. Pl. 856; Cooke Fl. Bomb. ii, 469.

A straggling much-branched hoary-tomentose herb. Stems 3-4 ft. long, 4-angled; branches slender, clothed with appressed deflexed hairs. Leaves sessile or nearly so,  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. long, ovate or ovate-lanceolate usually acute, serrate; upper surface sparsely clothed with appressed hairs, densely white-tomentose beneath. Flowers subsessile, arranged in distant many-flowered whorls; bracts shorter than the calyx, linear, hairy. Calyx  $\frac{1}{4}$ - $\frac{1}{3}$  in. long, silky-villous outside, the upper half densely silky inside; teeth very short, triangular-subulate. Corolla white or purplish,  $\frac{1}{2}$  in. long, tube annulate above the middle; upper lip densely silky on both sides; midlobe of lower lip obovate, 2-fid. Nutlets  $\frac{1}{16}$  in. long, oblong-obovoid, obtusely truncate at the apex.

Dehra Dun, N. Oudh, Bundelkhand, often found climbing amongst bushes. DISTRIB. Subtropical Himalaya in Nepal and Kumaon, Bengal, Orissa, Khasia Mts. up to 4,000 ft., C. India, Konkan, Kanara, S. India and in Ceylon, extending to China.

VAB. *scaberula*, F. B. I. l.c.; Watt E. D.; Prain Beng. Pl. l.c.—More glabrous; calyx hispid.—Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gomkhpur. DISTRIB. Chota Nagpur, C. India and Khasia Mts.

9. *L. procumbens*, Desf. in Mem. Mus. Par. xi, 7, t. 3, f. 2; Royle Ill. 301; F. B. I. iv, 683; Prain Beng. Pl. 857; Cooke Fl. Bomb. ii, 470; Phlomis biflora, Roxb. Fl. Ind. iii, 12 (in part).

A procumbent perennial herb, root-stock woody; stems and branches slender, 2-3 ft. long, 4-angled, more or less pubescent on the angles. Leaves stalked  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long, elliptic-ovate or lanceolate, acute, serrate.

membranous, subglabrous, base usually acute, petioles  $\frac{1}{2}$  in. long. Whorls axillary, lax, 1-3-flowered, pedicels filiform, up to  $\frac{1}{2}$  in.; bracts minute, ciliate. Calyx  $\frac{3}{4}$  in. long, nearly glabrous, reticulate-veined, tapering to the base; teeth 10, subequal, lanceolate, acute, usually less than  $\frac{1}{10}$  in. long, ciliate. Corolla white,  $\frac{5}{8}$  in. long, tube annulate within, midlobe of lower lip emarginate. Nutlets  $\frac{1}{4}$  in. long, obovoid, truncate at the apex.

Bundelkhand (Duthie). DISTRIB. Cent. and E. Bengal, Nizam district of Cent. Prov., Belgaum, Kanara and Mysore.

*Leucas* sp. A small erect more or less hispid perennial herb with a woody root-stock. Stems rather slender, sparingly hispid with short appressed ascending hairs. Leaves sub-erect,  $\frac{1}{2}$ -1 in. long, linear or elliptic-oblong, obtuse, narrowed at the base into a very short petiole; margins entire, revolute; upper surface strigose with short white hairs, glabrous and minutely gland-dotted between the prominent hispid midrib and nerves. Whorls small, confined to the upper axils, few-flowered; bracts slender, linear-subulate, shorter than the calyx, hispidly ciliate. Calyx  $\frac{1}{2}$  in. long, obconic, tube almost glabrous except on the hispid ribs; mouth wide, slightly oblique, margin shortly ciliate; teeth distant, very minute, subequal. Corolla-tube about  $\frac{1}{2}$  in. long, not annulate within, midlobe of lower lip  $\frac{1}{4}$  in. long. Filaments sparsely pilose.—Near Indalpur in the Shahjehanpur district of Rohilkhand (Duthie No. 4316). Vern. *Chota guma*.—Resembles *L. hyesopifolia* in general habit, but the hairs on the stems are ascending (not spreading); the very rigid leaves are more erect, the whorls which are confined to the upper axils are smaller and fewer-flowered, and the mouth of the calyx is only slightly oblique. The above-mentioned characters indicate a possible alliance with *L. diffusa*, but the habit is very different. I have given provisionally the name of *L. linearifolia* to the specimen in the Kew herbarium, as the material is hardly sufficient for a complete description.

### 19. LEONOTIS, R. Br. Fl. Brit. Ind. iv, 691.

Herbs or shrubs. Flowers rather large, scarlet or yellow, arranged in axillary densely many-flowered whorls; bracts many, slender. Calyx 10-nerved, tube often incurved; mouth oblique, with 8-10 rigid teeth, upper tooth largest. Corolla 2-lipped; upper lip long, concave, with a villous crown; lower very small, 3-lobed, the midlobe largest. Stamens didynamous; lower pair longer, ascending, anthers connivent, cells divaricate. Disk equal. Ovary 4-partite; style subulate, the upper lobe very short. Nutlets 4, oblong or ovoid, triquetrous, obtuse or truncate, dry, glabrous, basal scar small.—Species 12, mostly African, one of which occurs also in India and America.

*L. nepetaefolia*, R. Br. in Ait. Hort. Kew. ed. 2, iii, 409; Royle III. 301; F. B. I. iv, 691; Watt E D; Prain Beng. Pl. 857; Cooke Fl. Bomb. ii, 471. *Phlomis nepetifolia*, Roxb. Fl. Ind. iii, 8.—Vern. *Bara guma*.

A tall erect annual, 4-6 ft. high. *Stem* stout, puberulous, bluntly 4-angled deeply sulcate, the faces concave. *Leaves* membranous.  $2\frac{1}{2}$ -6 in. long ovate, acute, coarsely crenate-serrate, puberulous on both sides, base cuneate; petioles 1-4 in. long, winged above. *Whorls* axillary, dense, globose, many-flowered,  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. in diam; floral leaves lanceolate, deflexed; bracts up to  $\frac{1}{2}$  in. long, deflexed, linear, hairy, spine-pointed. *Calyx*  $\frac{1}{2}$  in. long, ribbed, puberulous below, upper part densely villous and clothed with long white bristly hairs, tube incurved, mouth oblique, throat glabrous; teeth unequal, spine-tipped, the upper one up to  $\frac{1}{2}$  in. long, ovate, acute, the rest smaller and triangular. *Corolla* orange-scarlet; tube  $\frac{1}{2}$  in. long, glabrous below, upper part hairy, inside with 3 parallel rings of white hairs; upper lip  $\frac{1}{2}$  in. long, densely woolly, lower  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. *Nutlets*  $\frac{1}{2}$  in. long, obliquely truncate.

Cultivated and naturalized in most parts of the area, but chiefly in the vicinity of villages. Flowers in Oct. *DISTRIB.* Throughout the hotter parts of India and in Ceylon, widely spread also in S. E. Asia, Trop. America and in Africa, in which latter country, it is believed by some to be indigenous. It is a very striking-looking plant when in flower.

## 20. NEPETA, Linn.; Fl. Brit. Ind. iv, 656.

Erect or prostrate herbs. *Leaves* opposite. *Flowers* blue white or yellow, arranged in axillary or terminal whorls. *Calyx* tubular, 15-nerved, equally 5-toothed or subbilabiate with the 2 lower teeth narrower than the upper. *Corolla* 2-lipped, tube not annulate within, throat inflated; upper lip straight notched or 2-fid; lower 3-fid, midlobe largest. *Stamens* didynamous, ascending under the upper lip or exserted, upper pair longer, anther-cells diverging. *Disk* uniform or enlarged in front. *Ovary* 4-partite, style shortly 2-fid; lobes subequal, subulate. *Nutlets* 4, ovoid or compressed, dry, smooth.—Species about 120, in Temp. Europe and Asia and in N. and S. Africa,

Whorls dense, many-flowered, lower ones distinctly stalked

1. *N. ruderalis*.

Whorls few-flowered, forming lax often drooping panicles with very slender filiform branches

2. *N. graciliflora*.

1. *N. ruderalis*, Buch.—Ham. Mss. ex. Hook. F. B. I. iv, 651; Watt E. D.; Collett Fl. Siml. 393; Prain Beng. Pl. 657; Cooke Fl. Bomb. 472. *Glechoma erecta*, Roxb. Fl. Ind. iii, 7.

A pubescent annual, 6-18 in. high, branching from the base; branches erect or ascending, obtusely 4-angled and grooved. *Leaves* stalked green or hoary,  $\frac{1}{2}$ - $2\frac{1}{2}$  in. long, broadly ovate or suborbicular, crenate, base cordate or truncate, petioles  $\frac{1}{4}$ - $1\frac{1}{2}$  in. long. *Flowers* stalked, unilaterally arranged

in dense many-flowered peduncled 2-branched cymes 1 in. or more in length; bracts  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, linear-lanceolate, acute, ciliate. *Calyx* (in flower)  $\frac{1}{2}$  in. long, villous and glandular-hairy; upper lip  $\frac{1}{10}$  in. long, with 3 triangular aristate teeth; lower lip shorter, with 2 subulate teeth. *Corolla* exserted, bluish-purple,  $\frac{3}{4}$  in. long, hairy outside; upper lip oblong, 2-fid., lobes obtuse; lower lip shorter, its midlobe broad emarginate and crenulate, much longer than the 2 rounded lateral ones. *Nutlets* minute, oblong-ellipsoid, brown spotted with white, mucilaginous when moistened.

Siwalik range, Dehra Dun and eastwards along the Sub-Himalayan tracts, also in the Agri district and in Merwara. *DISTRIB.* Plains of Punjab and Bengal, ascending to 5,000 ft. on the Himalaya, also in Central India, and the Konkan, extending to Afghanistan. The plant is used medicinally. It has a scent like that of Balm and a pungent bitterish taste.

2. *N. gracilliflora*, Benth. in Wall. Pl. As. Rar. i, 65; F. B. I. iv, 663; Collett Fl. Siml. 349.

A pubescent or nearly glabrous annual. *Stems* many, slender, 1-3 ft. high, erect or ascending. *Leaves* long-petioled, 1-1 $\frac{1}{2}$  in. long, ovate, or ovate-cordate, acute, coarsely crenate or serrate. *Whorls* few-flowered, the lower ones distinctly stalked, forming loose often drooping panicles with very slender branches; peduncles and pedicels capillary, bracts setaceous. *Flowers*  $\frac{1}{2}$  in. long. *Calyx*  $\frac{1}{4}$  in. long; upper teeth triangular-lanceolate, awned; lower shorter, setaceous. *Corolla*  $\frac{1}{2}$  in. long, pale-lilac or rose. *Nutlets* minute, oblong, granulate.

Common on steep rocks on both sides of the Siwalik range. Flowers in Nov. *DISTRIB.* Subtrop. Himalaya from the Punjab to Garhwal and Kumaon, up to 5,000 ft.

## 21. SALVIA. Linn.; Fl. Brit. Ind. iv, 653.

Herbs or shrubs. *Flowers* small, or large and showy; whorls usually racemed or in spikes; bracts small or large and often coloured. *Calyx* tubular or campanulate, 2-lipped, throat naked; upper lip entire or 3-toothed, lower 2-fid. *Corolla* 2-lipped, tube naked or with a ring of hairs inside; upper lip erect, entire; lower 3-lobed, lateral lobes spreading. *Stamens* 2 (the lower pair) perfect; filaments short, articulate with the slender connective, sometimes produced beyond the joint, anthers dimidiate; connective linear, transverse, the upper arm ascending and bearing a linear fertile cell; the lower arm straight or deflexed, bearing a fertile or an empty cell, or naked, the 2 upper (posterior) stamens represented by small staminodes or obsolete. *Disk* usually enlarged in front. *Ovary* 4-partite; style

shortly bifid, lobes equal or the anterior longer. *Nutlets* 4, ovoid, triangular, dry, smooth, basal scar small.—Species about 450, chiefly in temperate and tropical regions of the world.

An erect annual, leaves 1-3 in. long, upper lip of calyx entire.

1. *S. plebeia*.

A straggling undershrub, leaves not exceeding 1 in., upper lip of calyx 3-toothed.

2. *S. ægyptiaca*.

1. *S. plebeia*, R. Br. *Prod.* 501; Royle *Ill.* 301; F. B. I. iv, 655; Watt E. D.; *Prair. Beng. Pl.* 859; Cooke *Fl. Bomb.* ii, 474. *S. brachiata* Roxb. *Fl. Ind.* i, 145.

An erect roughly pubescent annual, 6-18 in. high. Stems stout, fastigately branched, obtusely 4-angled and grooved, hoary-pubescent. Leaves 1-3 in. long, oblong-lanceolate, obtuse or subacute, crenate-glabrous or slightly hairy, base usually acute and often decurrent, petioles 1-2 in. long. Flowers in panicles usually compact glandular-pubescent spicate racemes; floral leaves stalked,  $\frac{1}{10}$  in. long, ovate, subacute, bracts smaller and narrower. Calyx pedicelled, hairy,  $\frac{1}{10}$  in. long, enlarging in fruit; upper lip entire, shorter than the lower, reflexed. Corolla lilac or white,  $\frac{1}{2}$  in. long, tube annulate within, midlobe of lower lip much larger than the lateral ones. Nutlets minute, ovoid, brown when ripe.

A common weed in all parts of the area. Flowers Sep. to April. DISTRIB. Throughout India in the plains and up to 5,000 ft. on the Himalaya, but not in Ceylon; it extends also to China, the Malay Peninsula and Islands and to Australia. The seeds are used medicinally for their mucilaginous properties.

2. *S. ægyptiaca*, Linn. *Sp. Pl.* 23; F. B. I. iv, 656; Watt E. D.; Cooke *Fl. Bomb.* ii, 474.

A low much-branched straggling undershrub; branches spreading, rigid, 4-angled, hairy or more or less scabrid. Leaves shortly stalked, varying in length up to 1 in., linear-lanceolate, acute, crenate, much-wrinkled, hairy, nerves and veins prominent beneath. Whorls distant, 2-4 flowered, arranged in long racemes; floral leaves small, ovate-lanceolate. Calyx glandular-hairy,  $\frac{1}{2}$  in. (when in flower), enlarging in fruit and nodding, upper lip 3-toothed. Corolla  $\frac{1}{2}$  in. long, tube annulate within; upper lip oblong or subquadrate, slightly notched. Nutlets  $\frac{1}{12}$  in. long, oblong-ellipsoid, nearly black.

Within the dry western borders of the area in the neighbourhood of Delhi (Jacquemont, etc.). DISTRIB. Plains of Punjab and Sind and westwards to Afghanistan; also in W. Asia, N. Africa and the Cape Verde Islands.

VAR. *pumila*, F. B. I. iv, 656; Watt E. D.; Cooke *Fl. Bomb.* iv, 575; *S. pumila*, Benth.; Decne in Jacquem. Voy. Bot. 129, t. 133.



More scabrid and villous than the type. *Leaves* very rigid and rugose. *Calyx* longer, villous with long hairs.—In the drier western portions of the area from Delhi to Bandelkhand and Morwara. *Flowers* Nov.-Jan. *DISTRIB.* Punjab plain and Salt range up to 2,500 ft., Sind, Gujarat and Decan; also in Afghanistan and Baluchistan.

*S. coccinea*, Juss. A slender herb up to 3 ft. high with handsome scarlet flowers. It is often grown in the gardens of N. India, and is a native of C. and S. America.

*S. officinalis*, Linn. (Common Sage) is a native of S. Europe. It is sometimes cultivated in gardens within the area.

## 22. MOSLA, Buch.-Ham.; Fl., Brit. Ind. iv, 646.

Annual fragrant herbs. *Leaves* opposite. *Flowers* very minute; whorls 2-flowered, arranged in terminal and axillary secund racemes; bracts very small, or the lower leaf-like. *Calyx* campanulate, 5-toothed, enlarged in fruit, subequal or 2-lipped, base gibbous; upper lip truncate or 3-toothed, lower of 2 longer teeth, throat closed with hairs. *Corolla-tube* naked or with a ring of hairs; lips short upper notched, lower 3-lobed. *Stamens* 2, posticous, short, erect, distant; anther-cells 2, divaricate, staminodes 2. *Disk* a large posticous gland. *Nutlets* globose, smooth or reticulate.—Species 7 or 8, in India, Burma and China.

*M. ocymoides*, Buch.-Ham. ex. Benth. in Wall. Pl. As. Rar. i, 66. *M. dianthera*, Maxim.; P. B. J. iv, 647. *Hedeoma nepalensis*, Benth.; Decuss. in Jacquem. Voy Bot. 133, t. 133. *Lycopus dianthera*, Buch.-Ham.; Roxb. Fl. Ind. i, 144.

A slender erect sparsely pubescent herb, 1-3 ft. high. *Leaves* stalked, 1-1½ in. long, ovate, acute, serrate, petioles ½-¾ in. long. *Racemes* terminating the branches, slender, lax-flowered. *Calyx* (in fruit) ¼ in. long, hemispherical. *Corolla* white or purplish, ¼ in. long, tube short. *Nutlets* reticulate.

Dehra Dun, on the Nagsidh Hill at about 2,000 ft. (Gamble) *DISTRIB.* Himalaya from Kashmir to Bhutan up to 6,000 ft., and on the Khasia Mts., extending to Burma and China.

## 23. TEUCRIUM, Linn.; Fl. Brit. Ind. iv, 700.

Herbs or shrubs. *Leaves* entire serrate or lobed, floral leaves often bract-like. *Whorls* 2-6-flowered, arranged in axillary or terminal spikes racemes or heads. *Calyx* 10-nerved; teeth 5, equal or the uppermost larger. *Corolla* apparently 1-lipped, tube not annulate within, limb slit behind, the 2 upper and the lateral lobes cuneate

or very short or obsolete, lower-lobe very large. *Stamens* didynamous; the lower pair longer, exserted; anthers reniform; the cells short, at length confluent. *Disk* equal. *Ovary* 4-lobed; style 2-fid, its lobes subequal. *Nutlets* 4, obovoid, rugosely reticulate; scar oblique or lateral, often extending more than half-way up the nutlet.—Species about 100, mostly in the warm temperate regions of the world.

*T. stoloniferum*, Roxb. *Hort. Beng.* 44; *Fl. Ind.* iii, 3; *F. B. I.* iv, 700. *Prain Beng. Pl.* 860.

An erect perennial herb, 1-2 ft. high, glabrous or puberulous. *Stem* stoloniferous often woody below. *Leaves* 1-3 in. long, ovate or ovate-oblong-subacute, deeply crenate or subserrate; base truncate or cuneate, rarely cordate. *Racemes* slender, simple or paniced; bracts lanceolate, pedicels in fruit usually longer than the shortly campanulate Calyx. *Calyx*  $\frac{1}{2}$  in. long, glandular-pubescent; lower teeth short, obtuse. *Corolla* pink, tube included, limb very small. *Nutlets* enclosed in the globose calyx-tube, nearly smooth.

In the Kheri district of N. Oudh (Duthia). Flowers in May. *DISTRIB.* Bengal plain, Chittagong, Sikkim, Himalaya up to 5,000 ft., also on the Khasia Hills; extending to Burma, Java and China.

## 24. AJUGA, Linn.; *Fl. Brit. Ind.* iv, 702.

Annual or perennial herbs, often decumbent or stoloniferous. *Leaves* usually coarsely toothed. *Flowers* sessile; whorls 2- or more-flowered, axillary or in terminal leafy spikes. *Calyx* 10- or more-nerved; teeth 5, subequal. *Corolla* 2-lipped, marcescent, tube often annulate within, throat slightly dilated; upper lip very short, 2-fid.; lower spreading; the midlobe usually largest, emarginate or 2-lobed. *Stamens* didynamous, the lower pair longer, ascending, exserted or included, anthers 2-celled; cells diverging or divaricate, at length confluent. *Disk* uniform or swollen behind. *Ovary* shortly 4-lobed; style 2-fid., the lobes nearly equal. *Nutlets* 4, obovoid, rugosely reticulate; scar lateral, extending beyond the middle of the nutlet. Species 30, in temperate and subtrop. regions of the Old World.

Corolla-tube straight, base not inflated . . . 1. *A. bracteosa*.

Corolla-tube geniculate above the swollen base . . . 2. *A. macrosperma*.

1. *A. bracteosa*, Wall. ex. Benth. in Wall. *Pl. As. Rar.* i, 59; *F. B. I.* iv, 702; Collett *Fl. Siml.* 406.

A perennial herb, softly hairy or glabrate, stolons none; branches many, 4-12 in. long, usually stout, erect or ascending, simple or branching,

leafy. *Leaves* 1-4 in. long, ovate oblanceolate or subspathulate, obtuse, serrate-toothed, the lower ones petioled. *Whorls* axillary, often crowded in spikes. *Flowers*  $\frac{1}{4}$ - $\frac{1}{3}$  in. long; bracts leaf-like, longer than the whorls, ovate or cuneate-obovate, entire or toothed. *Calyx*  $\frac{1}{8}$  in. long, villous; teeth half as long as the tube, ovate-lanceolate, acute. *Corolla* pale-blue or lilac, pubescent; tube exserted nearly as long as the calyx; upper lip erect, lateral lobes of lower lip oblong, midlobe varying in length. *Stamens* exserted. *Nutlets*  $\frac{1}{10}$  in. long, deeply rugose.

Dehra Dun and on the Siwalik range, and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, **DISTRIB.** W. Himalaya from Kashmir to Nepal up to 7,000 ft., and on the Punjab plain along the base of the hills from Peshawar; extending to Afghanistan, China, Japan and Abyssinia.

2. *A. macrosperma*, Wall. ex Benth. in Wall. *Pl. As. Rar.* i, 58; *F. B. I.* iv, 704; *Prain Beng. Pl.* 860. *A. repens*, Roxb. *Fl. Ind.* iii, 3.

A decumbent or prostrate herb, glabrous or somewhat pubescent. *Stems* or branches  $\frac{1}{2}$ -3 ft., often stout, spreading and branching and sometimes rooting from the nodes, glabrous or densely hairy. *Leaves* stalked, 2-6 in. long, variable in breadth, ovate-oblong or obovate, obtuse, serrate-crenate, rarely lobed or cut, narrowed into the often very long petiole. *Whorls* continuous or interrupted; lower bracts leaf-like; upper ovate, shorter than the calyx. *Calyx-teeth* very short, obtuse. *Corolla* blue, usually glabrous; tube twice as long as the calyx, inflated at the base, geniculate above the swelling; limb small, upper lip erect, lobes of lower lip subequal or the midlobe broader. *Stamens* exserted. *Nutlets*  $\frac{1}{12}$ - $\frac{1}{10}$  in., rugosely pitted.

Dehra Dun and eastwards along the Sub-Himalayan tracts of Rohilkhand N. Oudh and Gorakhpur. *Flowers* in March and April. **DISTRIB.** Subtrop. and Temp. Himalaya from Kumaon to Bhutan, up to 8,000 ft., Khasia Mts. and Chittagong, extending to Burma and China.

The following cultivated species belonging to genera which are not indigenous within the area of this flora should be mentioned:—

*COLEUS AMBOINICUS*, Lour.; *Cooke Fl. Bomb* ii, 449. *C. aromaticus*, Benth.; *F. B. I.* iv, 625; *Watt E. D.*; *Prain Beng. Pl.* 846. *Plectranthus aromaticus*, Roxb, *Fl. Ind.* iii, 22. Vern. *Pathor chur*.—A fragrant perennial herb, 1-3 ft. high. *Stems* fleshy. *Leaves* stalked, broadly ovate, cordate, crenate, villous or tomentose. *Corolla* pale-purple, but the flowers are usually not developed. The plant is frequently grown in native gardens. Roxburgh mentions that the leaves are often eaten with bread and butter, or are used as a flavouring ingredient in country beer. They may also be employed as a substitute for borage, and the plant is sometimes known as "Indian borage." It is a native of the Moluccas. *Coleus barbatus*, Benth, a species allied to the above, is common on the outer ranges of the Himalaya up to 8,000 ft., usually in wet ground. It is found also on Parasnath in Chota Nagpur, and

in the hilly parts of the W. Peninsula to Ceylon, extending to Trop. E. Africa. It may possibly occur wild within the northern boundary of the area of this flora.

**PERILLA OCYMOIDES**, Linn.; *F. B. I.* iv, 646; *Watt E. D.*; *Duthie Field and Gard. Crops N. W. Prov. and Oudh, part iii, 45*; *Collett Fl. Siml. 590*; *Prairie Beng. Pl. 851*. *Mentha perilloides*, Willd.; *Roxb Fl. Ind. iii, 7*. Vern. Bhanjira.—An erect aromatic herb, 2-4 ft. high, with ovate or rounded crenate or coarsely serrate leaves. Whorls 2-fid. forming long axillary and terminal secund racemes, Calyx 2-lipped, 5-toothed, gibbous at the base, enlarging in fruit. Corolla white, limb 5-fid. Nutlets globose, reticulate.—The plant is wild and cultivated on the outer ranges of the Himalaya from Kashmir to Bhutan up to 10,000 ft. and extends to Burma, China and Japan. It is grown near villages in Dehra Dun and eastwards along the Sub-Himalayan tracts and in Chittagong. The oil yielded by the seeds is much valued for culinary purposes, as well as for burning.

**MENTHA**. A large genus of aromatic plants found chiefly in northern temperate regions. They include several kinds of mint, which are known to the natives of India by the general name of *podina*, and are largely grown in their gardens as pot-herbs. *M. sylvestris*, L. is the horse-mint. It is common on the Western Himalaya up to 12,000 ft. The variety *icana* with more slender and much interrupted spikes, and with a smaller calyx and white corolla, occurs in Dehra Dun in a semi-wild state and is probably an escape from cultivation. Other species occasionally met with in native gardens within the area are spear-mint (*M. viridis*), marsh-mint (*M. arvensis*), and pepper-mint (*M. piperita*). They are all more or less in use for culinary or medicinal purposes.

**MERIANDRA BENGALENSIS**, Benth; *F. B. I.* iv, 652; *Watt E. D.*; *Prairie Beng. Pl. 858*; *Cooke Fl. Bomb. ii, 475*, *Salvia bengalensis*, *Roxb. Fl. Ind. i, 145*.—A large straggling shrub with white flowers. It is cultivated in native gardens within the area of this flora and throughout the greater part of India, and is often known under the name of "Bengal Sage." The leaves have a strong camphor-like scent and are used medicinally and also for preserving cloth from the attacks of insects.

## LXXXVIII.—PLANTAGINACEÆ.

Scapigerous annual or perennial herbs. Leaves usually radical. Scapes axillary. Flowers small, spicate, often dimorphic. Sepals 4, imbricate in bud, persistent. Corolla hypogynous, salver-shaped, scarious; lobes 4, short, imbricate in bud. Stamens 4, inserted on the corolla-tube; filaments capillary, inflexed in bud, persistent; anthers large, pendulous, versatile. Ovary superior, 1-4-celled; style filiform, with 2 lines of stigmatic hairs, ovules 1-8 in. each cell. Fruit a

1-4-celled capsule, dehiscing circumscissilely, membranous, 1-or-more-seeded. *Seeds* usually peltate; testa thin, mucilaginous, albumen fleshy; embryo cylindric, transverse, radicle inferior.—Species over 200, chiefly in temperate and subtropical regions.—The above description does not include the two anomalous monotypic genera *Littorella* and *Bougueria*.

**PLANTAGO.** Linn.; Fl. Brit. Ind. iv, 705. Characters of the Family.

Flowering spikes slender, 2-6 in. long; cells of capsule 4-8 seeded . . . . . 1. *P. major*.

Flowering spikes ovoid,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long; cells of capsule 1-2 seeded . . . . . 2. *P. amplexicaulis*.

1. *P. major*, Linn. *Sp. Pl.* 112; *F. B. I.* iv, 705; *Watt E. D.*; Collett Fl. Siml. 407; Cooke Fl. Bomb. ii, 477. *P. asiatica*, Linn.; Wall. in Roxb. Fl. Ind. ed. Carey and Wall. i, 423.

A perennial herb, glabrous or nearly so. *Rootstock* stout, erect, truncate. *Leaves* petioled, all radical, alternate, 2-5 in. long, oblong or oblong-ovate, obtuse or subacute, entire or sinuate-toothed, 3-7 ribbed, base tapering and decurrent into the long sheathing petiole. *Flowers* usually crowded in long slender cylindric spikes, 3-6 in. long or more; bracts equalling or shorter than the calyx, concave, ovate-oblong, obtuse, margins scarious. *Calyx*  $\frac{1}{2}$  in. long, glabrous; sepals oblong, obtuse or subacute, obtusely keeled on the back, margins broadly scarious. *Corolla*  $\frac{1}{2}$  in. long, glabrous; lobes lanceolate, acute, reflexed. *Antthers* purple. *Capsule* 2-celled,  $\frac{1}{2}$   $\frac{1}{2}$  in. long, ovate, glabrous, splitting transversely near the base, cells 4-8 seeded. *Seeds* minute, angled, dull-black, rugulose.

Dehra Dun and Siwalik range. Flowers in July. **DISTRIB.** Temperate and alpine Himalaya from Kashmir to Bhutan and up to 12,000 ft. in Baltistan; Konkan, Deccan, Nilgiris and Ceylon; also in Assam, the Khasia Hills, Burma and the Malay Peninsula, extending to Afghanistan and westwards to the Atlantic. In many of the above-mentioned localities the plant has probably been introduced. The leaves are applied to bruises in the Punjab, and the seeds are used medicinally as a substitute for *ispaghul* (*P. ovata*).

2. *P. amplexicaulis*, Cav.  *Ic.* ii, 22; *F. B. I.* iv, 706; *Watt E. D.*, Cooke Fl. Bomb. ii, 477. *P. Bauphula*, Edgew. in Hook. Journ. Bot. ii, 285.

Annual or perennial, sparsely hairy or glabrate, stemless or with a short often branching stem. *Leaves* radical, alternate, 3-6 in. long, narrowly lanceolate, acuminate, entire or sparingly toothed, tapering to the sheathing base. *Scapes* many, axillary, usually exceeding the leaves, terete, glabrous. *Spikes* ovoid,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long; bracts  $\frac{1}{2}$  in. long, cucullate, broadly ovate-oblong, obtuse, glabrous, membranous except the green midrib. *Calyx* as long as or slightly exceeding the bracts; sepals ovate-

oblong, sub-acute, membranous with green midrib, or the inner entirely membranous. *Corolla* glabrous, tube  $\frac{1}{4}$  in. long; lobes as long as the tube, ovate, acute, concave. *Capsule*  $\frac{1}{2}$  in. long, ovoid, subobtuse, cells 1-2 seeded. *Seeds*  $\frac{1}{8}$  in. long, boat-shaped, nearly black.—*Malwa* (Edgeworth). *DISTRIB.* Punjab Plain westward from the Sutlej; also in Sind, extending westwards to Egypt and Greece. The seeds are sometimes used as a substitute for those of *P. ovata*.

**P. ovata.** *Forsk. Fl. Egypt. Arab.* 31; *Duthie Field and Gard. Crops*, N. W. *Prov. and Oudh part iii*, 53, t. 92; *F. B. I.* iv, 707; *Watt B. D.*, *Cooke Fl. Bomb.* ii, 478. *P. Ispaghula*, *Roxb. Fl. Ind.* i, 404; *Royle IV.* 312. *Vern. Ispaghul, isafgol.*—A softly hairy annual, stemless or nearly so. *Leaves* linear or filiform, finely acuminate. *Spikes*  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, ovoid or cylindric. *Sepals* elliptic, obtuse. *Corolla-lobes* rounded, apiculate. *Capsule* 2 seeded. *Seeds* light-brown. This plant is cultivated in some of the western districts of the area for the sake of the seeds, which yield, when boiled, a large amount of tasteless mucilage. This latter is much used by the natives as a remedy for diarrhoea and dysentery. The plant grows wild in the Punjab Plain and on low hills from the Sutlej westwards, extending to Persia, Spain and the Canary Islands.

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